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ST. LOUIS BECKONS

The annual A.V.A. conventions have an unbroken record of success since their inception. Judging by the efforts put forth by the local committee at St. Louis, the convention to be held there November 30, December 1, 2, and 3, will register a memorable attendance, and mark another year of progress in the history of industrial arts and vocational education.

The convention city itself has much to offer. Directors, supervisors, and teachers interested in industrial arts, part-time and full-time vocational education, teacher training, guidance, rehabilitation, and home economics, should, therefore, prepare to attend this annual gathering of their fellows, and help them discuss, define, and plan the future of the educational work in which they are interested.

IN THIS ISSUE

Teachers of industrial arts and vocational education who are interested in testing will find good examples in the Blueprint-Reading Test, the Seventh-Grade Woodworking Test, the Final Safe-Driving Examination, and the Ninth Grade Mechanical-Drawing Scale.

Metalworking instructors will find the following articles very helpful: Metal Book Ends, the Drill Gauge Magnifies Error, Sugar Bowls and Creamers, Metalworking Kinks, Napkin Clip, Pewter Candlestick, Drill Rack and Soldering Slab, and the Copper Tray.

Woodworking instructors will be interested in the Finishing Chart, the Bottle Cabinet for the Workshop, the Pilot Light for the Glue Pot, the Toy Train for First and Second Graders, the illustrated work sheet on What to Do with Fungus, the Indoor Archery Backstop, the Sawdust Hopper, Box Looms and Roller Box Looms, and the Mortise-and-Tenon Joint — X.

For instructors in mechanical drawing, the following articles have been provided: Philosophy and Objectives for Mechanical Drawing, the drawing scale and blueprint-reading test already mentioned, Mechanical-Drawing Binders, and the laying out of the sawdust hopper.

Printing instructors, no doubt, will find Block Printing for Junior High Schools and Printing Word Pictures much to their liking.

Electrical instructors will find excellent jobs for co-operative endeavors with other shops in the Signal System for Girls' Basketball, and the Pilot Light for the Glue Pot.

Teachers of auto mechanics will find the Final Safe-Driving Examination of great assistance.

All shop teachers, of course, will be able to get much of interest and helpfulness out of the articles on Attitudes and Ideals Developed by Industrial Arts, The Public Must Be Told, Distinctive Elements of the Industrial-Arts Program, Which Should Be Stressed — Speed or Accuracy, and the second part of Predicting Trade-School Success.

Articles Indexed — The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."
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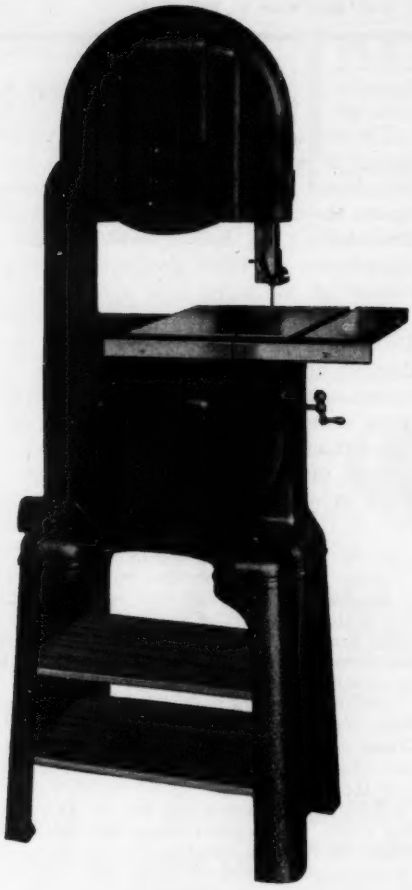
Editorial Contributions — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.
The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Philippine Education Co., Manila, P. I.

W-14, W-16 BAND SAW



This smooth running band saw is as modern in construction and design as it is in appearance. More than that, it is exceedingly practical as well. This factor, together with its many structural and operating advantages, has made it *the most popular machine we have ever announced.* This popularity is based entirely on merit. Pattern makers, wood shop operators and industrial arts instructors have passed the word along that the Yates-American W line band saw is *the* saw to buy. Why? Even a superficial study of its many features clearly indicates its superiority.

Available in either the 14 or 16 inch size, this thoroughly modern band saw has many construction features found only on more expensive machines. The frame is cast in one piece with the dust chute an integral part of the frame. The cast-iron wheel guards are hinged, not screwed to the frame—making the machine easily accessible for changing blades. Every moving part of the saw is enclosed except, of course, at the actual point of cut. *Yates-American safety features are built in!*

Other typical big machine features at small machine cost are the nickel-alloy cast-iron table which tilts 45° to the right and 5° to the left at the cutting line, "clog-proof" tilting mechanism, front table extensions which increase the cut-off capacity to 16½ inches, an industrial-type straining device, simultaneous adjustment of side guides, controlled roller guide and a double faced rip fence with micrometer adjustment. Find out more about this remarkable saw—send for complete information today.

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

This is the second of a series of brief articles dealing with various woods, their properties and uses. It is our hope that they might make interesting and helpful classroom material. Your comments will be appreciated.

YATES-AMERICAN

SHORT TALKS ON WOOD

CYPRESS *(Taxodium distichum)*

Often referred to as "The Wood Eternal" because of its decay-resisting and insect-resisting properties. Century-old structures built of cypress are still in existence—as are hand-split cypress shingles even after 250 years of service. It ranks as one of the most durable of American woods.

The American Cypress is not related to the European Cypress which is of no commercial importance and is used principally as an ornamental tree. Various types of cypress lumber are identified as follows: Red cypress (coast type), yellow and white cypress (inland type).

Cypress grows from Virginia to Florida and in a broad belt along the Gulf of Mexico to Texas. Inland it extends up the Mississippi to southern Illinois. Although important stands are available for exploitation, its range is somewhat limited and its price is higher than that of common utility woods which grow over wider areas. Thus its use is somewhat limited.

When commercially dry, cypress ranks as a medium light wood. Shows only a medium tendency to shrink or expand, has little tendency toward warping, twisting or buckling, possesses satisfactory nail-holding power and ranks high in gluing properties. It is unusually fine-grained—its waxy appearance makes an attractive natural finish. It takes and holds paint well.

Cypress is principally used in building and construction, particularly where the wood comes in contact with the elements and the ground. Also for caskets, boxes and crates, tanks and silos, fences and trellises, refrigerators and to some extent for furniture.

The full-grown cypress is one of the most picturesque of American forest trees. It is rather slow-growing, reaching its best development in swamp lands. Trees over a thousand years old are commonly found in virgin stands, reaching a height of over a hundred feet.

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Predicting Trade-School Success—II

Joseph W. Fleming

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This, the second part of the author's study, embraces the relation of the entering grade and of intelligence to persistence in attendance.

The Relation of Entering Grade to Persistence in Attendance

The treatment of the data for the relation of entering grade to persistence in attendance in the trade school is the same as given in the data for entering age. The same boys are used in both studies.

Table IV shows the relation between the entering grade and persistence in attendance. The entering grades are shown in one-semester or half-grade intervals; 9B is the first half of the ninth grade; the 9A, the second half of the ninth grade. The term of stay is shown in semesters. The average length of stay varies considerably, having a range of 1.00 to 6.52 semesters. The number of boys drops off rapidly as the entering grades become higher.

The averages at bottom of the table show that the 9B's and the 10A's stay longest in school. The difference between these two averages, 2.94 and 2.83, is small and is not a reliable difference. The critical ratio is .93.

Another approach was made through a grouping of the trades, the same as for entering age.

Table V shows this grouping of trades. The averages vary considerably. The 9B's stay longer than any group except the 10A's. The 10A's show a longer stay in the building, the metal, and the graphic-arts groups; but the number of these 10A's is relatively small in proportion to the number of 9B boys.

A third approach was made through grouping the entering grades into four grade groups on the basis of one-year step intervals instead of the half-year step intervals and computing the percentage of cases staying in school for varying periods of time for each grade group.

The entering grade groups were combined into four groups. The 9B's and A's were classed as the ninth grade; 10B's and A's classed as the tenth; the 11B's and A's as the eleventh; the 12B's and A's as twelfth and post-graduate grades, as P.G.'s.

The curves show the percentage of boys for each grade group in school at given periods of time. The relative position of the curves is almost identical in the ninth-, tenth-, and eleventh-grade levels to the end of the third semester, a slight advantage for the tenth grades for the fourth and fifth semesters, with a decided drop for the eleventh grade at the end of the fifth semester. The ninth grades show an advantage over all others at the end of the sixth, seventh, and eighth semesters.

These curves show very little difference in the length of stay in school for the ninth, tenth, and eleventh grades up to the end of the fourth semester. Beyond the fourth semester, the ninth-grade boys stay longer.

TABLE IV

THE RELATION OF ENTERING GRADE FOR EACH TRADE TO TERM OF STAY IN THE TRADE SCHOOL

Shops		Entering Grade 9B	9A	10B	10A	11B	11A	12B&A	PG
Auto	N	87	22	55	10	15	3	4	3
	A	3.01	2.18	3.25	3.50	2.40	2.33	1.25	1.33
Bricklaying	N	44	5	6	1			2	
	A	2.56	2.80	3.33	1.00	.....	.....	1.00	.....
Cabinet	N	129	7	15	3	3			4
	A	2.38	2.14	3.20	1.33	1.00	.....	.....	1.00
Carpentry	N	40	8	7	1	1		1	1
	A	2.20	1.25	1.42	3.00	1.00	.....	2.00	1.00
Commercial Art	N	26	5	6	6	9	1	2	3
	A	4.38	1.80	3.16	3.16	2.55	3.00	5.00	2.00
Electric Wiring	N	113	21	20	3	3	1		2
	A	2.36	2.43	2.10	2.00	2.33	1.00	.....	1.50
Electric Power	N	42	11	23	13	7	3	3	8
	A	4.42	3.36	3.84	3.16	3.00	4.00	1.66	1.62
Foundry	N	48	5	12	4	1			
	A	2.18	3.00	2.41	2.00	3.00	.....	.....	.....
Machine	N	47	8	18	2	3		6	3
	A	3.02	2.37	2.38	3.00	2.66	.....	2.00	2.00
Pattern	N	32	2	8	2	1			
	A	3.21	1.00	2.50	1.50	1.00	.....	.....	.....
Plumbing	N	32	5	8		1	2		1
	A	3.12	4.00	2.00	.....	1.00	2.00	.....	2.00
Printing	N	58	10	31	5	10	4	2	3
	A	3.42	3.10	2.38	4.40	3.10	3.25	5.00	1.00
Radio	N	16	6	17	13	4	2		3
	A	3.18	1.83	2.47	2.46	2.00	1.50	.....	1.33
Sheet Metal	N	80	3	4	7				
	A	2.18	1.00	1.00	3.71	.....	.....	.....	.....
Telephone	N	9	1	13	6	4			2
	A	2.44	4.00	2.23	1.66	2.25	.....	.....	1.50
Trade Draft	N	44	7	17	2	9		1	3
	A	3.18	2.88	2.71	6.00	2.11	.....	1.00	2.66
Welding	N	19	3	15	7	9	3	3	6
	A	6.52	4.00	3.60	4.71	2.66	2.00	3.50	1.83
Totals	N	866	129	275	85	80	19	24	42
Average	A	2.89	2.46	2.40	2.94	2.42	2.63	2.25	1.61

N—Number of Boys A—Average Semesters in Attendance

Table VI shows the grades combined into one-year intervals in place of one-half-year step intervals.

The data in Table VI are shown in graph form in Chart 2.

TABLE V

RELATION OF ENTERING GRADE FOR TRADE GROUPS TO TERM OF STAY IN THE TRADE SCHOOL

		Entering Grade							
Trade Groups		*9B*	*9A*	*10B*	*10A*	*11B*	*11A*	*12B&A*	*PG*
Bldg. Trade	N	196	21	25	9	2	2	3	2
	A	2.42	2.23	2.00	3.33	1.00	2.00	1.33	1.50
Elect. Trade	N	180	39	73	35	18	6	3	15
	A	2.92	2.64	2.49	2.45	2.50	2.66	1.66	1.53
Metal Trade	N	202	38	100	23	28	6	13	12
	A	3.12	2.47	3.05	3.57	2.53	2.16	1.92	1.75
Wood Trade	N	201	17	30	6	5		2	5
	A	2.37	1.58	2.60	1.66	1.00	.....	1.00	1.00
Graphic Arts	N	128	22	54	13	28	5	5	9
	A	3.56	2.81	2.57	4.07	2.60	3.20	0.42	1.88

N—Number of Boys A—Average Number of Semesters

I.Q's under three headings of intelligence: Below normal (range of I.Q's from 50 to 89); normal intelligence (range of I.Q's from 90 to 109); and above normal intelligence (range of I.Q's from 110 to 140). It shows the percentage of boys remaining at the end of each semester for each I.Q. group, and reads as follows: At the end of the first semester, there were 193 cases with intelligence below normal, 429 cases with normal intelligence, and 115 cases above normal intelligence. These figures were used as the basis for figuring the percentage of boys remaining in school at the end of each semester for each of the three I.Q. groups.

The relation between intelligence and how long a boy stays in school is shown graphically in Chart 3. Both Table VIII and Chart 3 reveal the fact that the above normal group stays longest in school. Less than 10 per cent of the below normal group are in school at the end of the fifth semester compared with 17 per cent of the normal group and 27 per cent of the above normal group. The numbers drop off rapidly after the fifth semester.

The Relation of Intelligence to Persistence in Attendance

The same group of records were used in this part as were used heretofore. The number of boys, however, is not as large because of the number of missing I.Q. records. Records of 783 boys could not be obtained as the boys were already out of school and could not be tested. Data were available for 737 cases and are shown in the following tables and charts.

Table VII shows how long boys in each intelligence group remain in school. The intelligence is shown in step intervals of ten, and the attendance, in semesters.

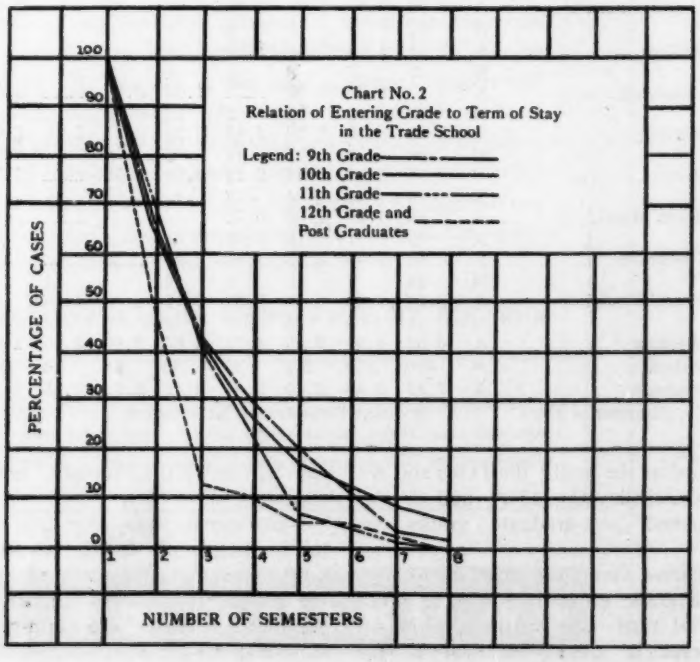
Table VIII shows the grouping of the

TABLE VI

PERCENTAGE OF CASES OF EACH GRADE GROUP IN THE TRADE SCHOOL AT THE END OF EACH SEMESTER

This table is a cumulative record of the number and percentage of boys in each entering grade group and the number of semesters they stayed in school. The percentages start at 100 at the end of the first semester. The figures shown are at the end of the semester.

	Entering Grade									
	9		*10*		*11*		*12 & P.G.*		*Total*	
Semester	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
1	994	100.0	359	100.0	99	100.0	68	100.0	1520	100.0
2	655	65.8	236	65.7	68	68.6	34	50.0	993	65.3
3	318	42.5	153	42.6	40	40.3	9	13.2	620	40.9
4	276	27.7	105	29.2	23	23.2	7	10.2	411	27.1
5	175	17.6	71	19.7	7	7.0	4	5.8	257	17.0
6	132	13.2	41	11.4	4	4.0	4	5.8	181	11.9
7	91	9.1	11	3.0	1	1.0	2	2.9	105	6.9
8	62	6.2	6	1.6	....	.....	....	.....	68	4.4



Summary of the Findings on Relation of Entering Age, Grade, and Intelligence to Persistence in Attendance at the Trade School

Relation of Entering Age to Persistence in Attendance. Tables I to III show the 14–15-year-olds spent on the average a longer period of time in the trade school than any of the other age groups. Chart 1 showed a higher percentage of the 14–15-year-olds in school at the end of each semester than any of the other age groups. The difference in percentage of boys in school at the end of the fourth semester between the 14–15-year-olds and the 16–17-year-olds was only 4.8 per cent, showing a surprising stick-to-it attitude on the part of the older boys.

The differences in the average length of stay in the trade school for the various entering ages in the different trades, suggests that for those trades where short unit courses can be taught successfully, such as certain divisions within the auto

department and foundry-machine operators in the machine shop; certain divisions of printing; unit courses in radio and welding; the upper ages should be favored. Employment in these trades is open to the 18-year-old and with two years of training on top of his entering age of 16, he is then ready for employment. For those trades requiring a longer and more intensive training, the younger boys should be favored. This, of course, depends on the economic conditions of the home which determines whether or not it is necessary for the boy to start working at 18 years of age. If this can be postponed for another year or two, then the entering age may be advanced. The only exception to this recommendation would be in the case of the commercial-art department where the advantage seems to be with the younger boy.

Relation of Entering Grade to Persistence in Attendance. Tables IV to VI show that the average length of stay in school for the various entering grade groups favored somewhat the ninth grade. This advantage, however, varied between the different trade groups. Chart 2 shows the percentage of boys remaining in school up to the end of the third semester for all three of the grade groups, ninth, tenth, and eleventh, to be practically the same. From the third to the fifth semester, the percentage of boys in the eleventh grade dropped off, while the ninth and tenth grades held together up to the end of the sixth semester. Beyond this, the ninth grade had a large percentage of boys in school.

These findings show that if selection is to be based on the length of stay in the trade school, the 14–15-year-olds and the ninth graders should be given preference. This is important to know for those trades requiring a longer training period. For those trades requiring a shorter training period, the selection of boys should be made from the older and more advanced grades, as the length of stay in the trade school for these boys becomes shorter with increase in age and advancement in grade.

Relation of Intelligence to Persistence in Attendance. Table VIII shows that the below normal do not stay in the trade school as long as the normal and above normal intelligence groups. Chart 3 shows in graph form the percentage of boys in school at the end of each semester. Intelligence, is, therefore, a factor that needs to be considered when selecting boys for the trade school. This is particularly true when length of time in preparation for a trade is a function of success in that trade.

(To be continued)

TABLE VIII

PERCENTAGE OF BOYS IN EACH INTELLIGENCE GROUP IN THE TRADE SCHOOL AT THE END OF EACH SEMESTER

Semesters	Below Normal I.Q.'s (50-89)		Normal I.Q.'s (90-109)		Above Normal I.Q.'s (110-140)		Total
	%	N	%	N	%	N	
1	100.0	193	100.0	429	100.0	115	737
2	59.0	114	66.4	285	73.0	84	483
3	37.3	72	40.3	173	46.9	54	299
4	21.7	42	26.8	115	37.3	43	200
5	8.8	17	17.2	74	27.8	32	123
6	6.7	13	13.2	57	20.8	24	94
7	3.1	6	9.0	39	9.5	11	56
8	2.0	4	4.6	20	7.8	9	33

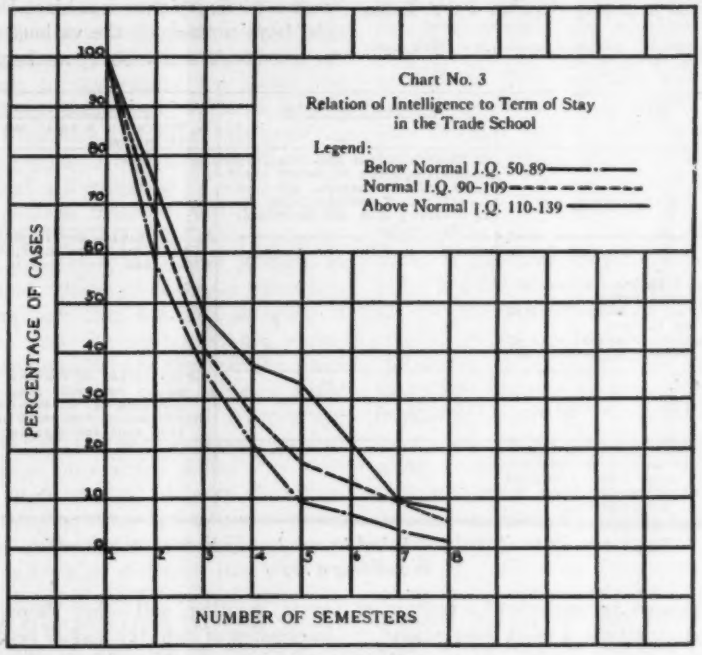


Chart No. 3
Relation of Intelligence to Term of Stay in the Trade School
Legend:
Below Normal I.Q. 50-89
Normal I.Q. 90-109
Above Normal I.Q. 110-139
PERCENTAGE OF CASES
NUMBER OF SEMESTERS

TABLE VII

RELATION OF INTELLIGENCE TO TERM OF STAY IN THE TRADE SCHOOL

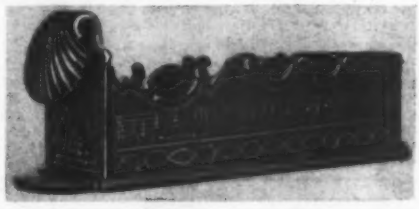
This table shows the total number of boys in each I.Q. group at the end of each semester.

Semesters	I.Q.'s 55*	65	75	85	95	105	115	125	135	Total
1	3	14	44	132	239	190	90	19	6	737
2	1	5	23	85	164	121	62	16	6	483
3	1	4	14	53	97	76	41	9	4	299
4	0	3	8	31	66	49	32	7	4	200
5	0	0	1	16	43	31	24	5	3	123
6	0	0	1	12	34	23	19	5	0	94
7	0	0	0	6	25	14	10	1	0	56
8	0	0	0	4	10	10	9	0	0	33

*55 I.Q.—I.Q.'s from 50 to 59.9

AN OLD PLANE

The craftman's pride in his tools has been an outstanding characteristic of the real artisan down the centuries. Probably this was more apparent, however, when workers had to design and make their own tools. If the ornamentation used on some of these tools may be taken as a criterion of the old craftsmen's esteem for the implements with which they worked, their love of tools must have been great indeed.



The steel plane illustrated herewith may be taken as an example. This plane was used, and no doubt made, by the famous violin maker, Jaques Boquay, of Paris. His name, with the address Rue D'argenteuil, and the date 1719, are engraved on the end of the plane. On the front are shown some musical instruments, and running around the sides is an old French love song with the music. The tool is 8½ in. long and takes a 1½-in. cutter. A lateral bar, riveted into the sides, provides a surface against which a wedge was driven. The plane was probably lined with wood originally, but all traces of this have disappeared. The cutter slopes at an angle of about 30 deg. The sole is brazed on.

Attitudes and Ideals Developed by Industrial Arts

Ed. P. Westmoreland

Principal,
Armstrong High School,
Washington, D. C.

Part of the report on an investigation of industrial arts in the high schools of divisions 10–13 of the public schools of the District of Columbia.

It is the purpose of this article to translate the functions of industrial-arts work in terms of developing attitudes and ideals, the sum of which, it is commonly agreed, equals *character*.

According to Brewer,[1] the ethical, thoughtful, co-operative, wholesome, and cultural attitudes should underlie and permeate the skill, technical knowledge, and social-understanding phases of the learning processes. These three phases of learning, together with the approximate synonyms are illustrated in the following analysis and in terms of the various subjects of the industrial arts of the secondary schools of divisions 10–13 of the District of Columbia.[2] These illustrations are given in short for the purpose of this study, for it is realized that a complete analysis along this line would involve a lengthy treatise in the light of the three basic tendencies in present-day education, namely: (1) giving the children a continuity of experiences; (2) bringing subject matter closely to the immediate needs and understanding of the everyday problems of the pupils; and (3) desire and tendency to break down the lines of demarcation between the departments. These suggestions in Table I are illustrative of some one unit of each of the subjects of the industrial arts and are suggestive of the functions of all the units in the matter of developing attitudes and ideals.

It is obvious, from the foregoing analysis, that the steps taken by students in solving the various problems afforded by different subjects in the industrial arts of the high schools of divisions 10–13, include activities of skill which have a definite relationship to technical knowledge and social understanding, and which can be analyzed in a very detailed way.[3] Table II which shows an analysis of a project in applied electricity is a good illustration:

In most of the activities of the industrial arts, doing (skill), narrowly considered, has a visible manifestation and takes the form which might be photographed with a motion-picture machine. For example, boys working at the various machines in woodwork, automobile, mechanics, shoe work, printing, and other shops, give an impression of industry mainly because they are doing something. No one can see the amount of thinking which is behind this doing nor ascertain to what extent there is being developed an understanding of the social needs and reactions in regard to the finished product. It is rather the conception of the importance of the doing which has led many teachers of the industrial arts to overemphasize skills. Exhibits have often afforded the opportunity to show articles of wood, metal, leather, and the like, that are skillfully made. Certain administrators interrupt the continuity of experiences in shopwork in order to get certain jobs done quickly and skillfully as the need arises without regard for the development of the pupil.[4] These and other influences have to some extent limited the development of the technical knowledge and social-understanding phases of the learning processes.

[1]John M. Brewer, *Education as Guidance*, "The Attitudes Are Really Only Names for Our 'Knowledge' and 'Wisdom'" (New York: The Macmillan Co., 1933), p. 20.

[2]Arthur B. Mays, "The Development of Attitudes and Outlook" in *Industrial Art Teachers News Bulletin*, Amer. Voc. Assn. (Feb., 1929), Vol. LV, No. 1, pp. 35, 36.

[3]Brewer, John M., *Education as Guidance* (New York: Macmillan Co., 1933), p. 102.

Skill	Technical Knowledge	Social Understanding
		1. Desire for a radio and use for it in home
	2. Thinking about how to make it 3. Reading about different kinds of radios, hookups, and limitations of certain types 4. Deciding upon the particular type wanted	
		5. Determining how it will fit in with the space and furniture of room
6. Making a freehand sketch of the general setup 7. Selecting the various materials and tools 8. Beginning the actual work of wire connection, soldering, etc.		
		9. Inspection of results of the partly completed job, and comparisons and alterations in connection with what others have done and experienced
10. More work, involving measuring, purchasing materials, etc., which require related technical knowledge and social understanding		

Table II. Steps of skills, technical knowledges and social understanding in building a radio

Industrial Arts	Skills (Doing)	Technical Knowledge (How to Do)	Social Understanding (Reasons for doing)
Woodwork	Making a half-lap joint	Related knowledge of use of saw, square, and chisel	When to use this joint in connection with construction work
Auto mechanics	Adjusting carburetors	Related knowledge of gas and air mixtures	Ideals in terms of others' enjoyment from a smoothly running motor
Auto and sign painting Applied electricity	Designing a poster for advertising Wiring a house	Principles of design, proportion, and balance Sciences related to house wiring	What use to others and place in industry Dangers to others from fires caused by defective connections, etc.
Masonry, etc.	Mixing mortar	Knowledge of proper amounts of lime, sand, and cement	Dangers to others resulting from weak construction
Mechanical drawing	Lettering	Science of lettering	Understanding of present needs
Metalwork	Soldering	Related knowledge of acids, etc., and use	Application of soldering, as in fixing garbage cans
Printing	Setting type	Science of typesetting	Relationship of design and balance
Shoe work	Half-soling shoes	Knowledge of proper thread, and the like	Right attitude toward customers, etc.
Activities common to all shops	Cleaning up, checking and putting away tools; selection of tools, methods to be used after study of job or plan	Knowledge of advantages of scientific method and procedure; knowledge of system and order or arrangement	Right attitude and regard for cleanliness and order; the right conception of the place of scientific method as related to the advancement of industry

Table I. The industrial arts and the three elements of learning (with suggestive approximate synonyms and illustrations)

[4]Frederick J. Moffitt, "Interpreting the Industrial Arts," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION (June, 1936), Vol. 25, No. 6, p. 165.

According to Mays:[5] "Modern civilization is what it is, very largely, because of the railroads, street cars, elevators, the radio, concrete, steel, and a thousand other significant results of the development of the practical arts. But clearly, man cannot manage his way of living and thinking to conform to the marvelous things which impinge upon his consciousness at every turning and which determine the direction of his every movement, without his whole personality being shaped and colored by these same things. Man's spiritual culture is inevitably conditioned in this age by the things he has made and with which he has surrounded himself.... He has been too busy refining, admiring, and multiplying his creations to consider what they are doing to him, and to assure the obligation their existence imposes. It is here that organized education meets its great opportunity of this age, namely, to lead man to understand the social and spiritual significance of the work of his hands. Education can solve this problem, and in so doing, it may save man from unintentional self-education."

It is obvious, therefore, that if the work of the industrial arts is to function successfully in developing the proper attitudes in the present scheme of *character* education, more emphasis than has been accorded in the past must be placed on the social-understanding phase of the learning process. Brewer writes:[6] "The sense of social contribution and individual achievement for social good is a more important product of the shop than actual skills."

The effect of this tendency in education to develop ideals and attitudes on the program of the industrial arts in the secondary schools of divisions 10–13 of the public schools of the District of Columbia, involves a consideration of many factors which must be analyzed in the light of occupational situations, and in accordance with accepted educational principles. According to Briggs:[7] "The eighth issue asks to what extent the curriculum shall be extended to include the direction and the establishment of attitudes and ideals, in addition to the presentation of organized knowledge. If education is concerned with the development of the whole personality, it cannot neglect attitudes and ideals, especially as their sum is equivalent to what is generally recognized as character."

If the proper attitudes can be developed, then the extent of this development in the industrial arts will depend in a large measure upon the various practices and policies of shop teachers which affect the activities and consequently, the habit development of the students. The extent to which certain of these policies and practices can affect the development of the students is shown in Table III. While this analysis of these activities regarding policies and practices is not complete, it is suggestive of some of the activities of the teachers regarding the development of the whole personality of the student and indicate some of the factors that must be considered if the various subjects in the industrial arts are to function properly in the program of developing attitudes and ideals.

While these policies and practices, as listed in Table III are not inclusive of all that are used by the various shop teachers, nor indicative of those common to any one shop, they are sufficiently illustrative of the developmental and relationship objectives for the students. A brief discussion of each of these practices will facilitate an understanding of the extent to which they develop certain desirable habits in the students regarding right attitudes and ideals.[8]

Shop Coats, Overalls, or Aprons. The practice in certain shops to have boys work, at all times, in some type of shop attire not only saves the clothes from the oil, grease, and dirt of the shop, but inculcates within the boy a high regard for cleanliness. It is obvious that the student who daily emerges in shop attire before beginning his various manipulative experiences, and washes up and changes before going to other classes, will acquire habits that will carry over into his life in the community. Their development of a social understanding will be apparent in such habits as refraining from seeking jobs, going on the various jobs, riding in public vehicles, and during other social contacts, while being in dirty working clothes. It will help them form the habit of changing, if at all possible, at the time and place of actual work.

Projects Supplied by the School. The situation in most of the secondary schools of divisions 10–13 of Washington, D. C., is such that various emergencies afford the use for projects of work in most of the shops. Such projects should not be assigned to the various shops without consideration of the continuity of the development of manipulative skills and knowledges required in a particular shop, or to what extent they will affect the development of proper attitudes and ideals. While it is desirable, in this day of many relief agencies, to develop within our students ideals that will motivate a spirit of contribution to the needs of the school, it is also desirable to develop within the students a felt need for such contributions and an appreciation of the skills and knowledges necessary in shopwork. It is obvious that in the junior high schools, the time devoted to shopwork is so limited and fundamental skills and technical knowledge of the various subjects so important, that anything less than rigid prescription of manipulative experiences can hardly be justified.[9] Therefore, the assignment of public-school projects to junior-high-school students of the industrial arts should be made only when such projects contain all the units that have been proved necessary and possible of attainment without the actual work of the teacher. This same analysis is to some extent true for the senior high school and suggests the assignment of school projects to students in the vocational section of the various subjects. The vocational section connotes a definite choice of preparation for a specific industry; and therefore, school, community, or any project related to a specific shop or several shops, become opportunities for the development of the necessary skills and technical knowledge required for optimal success in the pursuit of such a vocation. The social-understanding phase of the learning process will be facilitated to a great extent if the assign-

[5] Arthur B. Mays, "Practical Arts as Moral Education," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION (March, 1936), Vol. 25, No. 6, p. 165.

[6] John M. Brewer, "Practical Arts for Vocational Guidance in Junior High Schools," *Manual Training Magazine*, Vol. 23 (Sept., 1921), pp. 60–72.

[7] Thomas H. Briggs, "The Issues of Secondary Education," *The Journal of the N. E. A.* (April, 1936), Vol. 25, No. 4, p. 106.

[8] Homer J. Smith, "Meeting Student Desires," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION (April, 1935), Vol. 24, No. 4, p. 105.

[9] H. D. Grubbs, "Educational and Vocational Guidance in Junior High Schools," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION (June, 1930), p. 212.

Policies and Practices	Developmental Objective	Relationship Objective
Shop coats, overalls or aprons for all students and teachers	Cultural attitudes and relation of work to neatness	Cultural philosophy not to ride on street cars with dirty working clothes, for example
Projects supplied by the school	Co-operative attitude in regard to school needs	The right philosophy concerning community obligations
Projects selected from a group	Initiative attitude through guidance	Thoughtful habits in regard to relationship to one's work to home and community interests
Projects selected from student's own experience with advice of teachers	Thoughtful and initiative attitude	Social and spiritual significance of work of one's hands
Outside contacts on the part of the student rather than teacher, i.e., estimating, buying and selling materials in shop work, woodwork, auto mechanics	Wholesome and ethical attitudes. Courtesy and honesty	A social understanding of the value of courtesy to others, for example
Subjective measures of shop conduct, regarding responsibility for use of tools, passing out, etc.	Ethical, co-operative, and wholesome attitudes	A philosophy that doing right things has its own reward in life
Objective measures of shop conduct, regarding responsibility for use of tools, passing out, etc.	Thoughtful and wholesome attitudes regarding law and order	A social understanding for the need of looking one's car, for example

Table III. Policies of the industrial arts and developmental and relationship objectives

ment of such school projects is made directly with the students, selected by the teacher. Then the students, entering into the discussion of the reasons for the projects, execute the plans of carrying out the projects and make contacts that will insure enthusiasm, co-operation, and certain appreciations that are closely related to a complete social understanding.

Projects Selected for a Group Supplied by the Teacher. The policy of some shop teachers of supplying a group of projects for the individuals of the classes to select from, is based on the theory that a complete development toward the objectives of the course can be more nearly fulfilled through latitude of choice under close control. This policy is especially applicable with good results in the junior high school and the first class of the senior high school. In this connection, however, the relationship as well as the developmental phase must be kept in mind if proper attitudes are to be developed. For example, projects designed for home use in a community of front and back yards, would hardly have application in an environment of flats or houses which do not have yard facilities. The success, therefore, of this practice on the part of the teacher in the matter of developing attitudes and ideals will require a close study of the immediate needs of the members of his class. The relationship objective of this practice would, therefore, be a development of the right philosophy concerning home and community obligations.

Projects Selected from Student's Own Experience and Advice of Teachers.[10] There is the policy of certain shop teachers to allow students to make what they choose in the shop, with proper consideration of the danger of selection beyond the ability of the pupil and interpretation of the skill and technical knowledge desired in the course of study. It is the problem, therefore, for the junior- and senior-high-school shop teachers, in pursuing this practice, to match the desires of students with the needs of the particular courses of study. In regard to the social-understanding phase of the learning process, their task involves the development of a thoughtful attitude on the part of the student. The relationship objective of this practice would, therefore, be the development of thoughtful habits in regard to the relationship of one's work to home and community interests.

Projects Made by Groups Under Student Foreman and Guidance of Teacher. The development of this practice in certain shops, of having groups of students work on projects under the direction of advanced students, has resulted from a need caused by large and ungraded classes. Such a practice, aside from facilitating the development of skills and technical knowledges in groups of ungraded ranges, offers from a *character* standpoint, the development of proper habits of respect for student foremen on the one hand, and habits of initiative in taking responsibility on the other. The success of this policy in the development of ideals and attitudes, depends to a large extent on the resourcefulness of the teacher in organizing the groups and supplying the appropriate projects of manipulation. The relationship objectives of this practice would, therefore, be the development of a social understanding in regard to the responsibilities of leadership and of following directions as given by those in command.

Direct Contacts for Students. The policy of certain teachers in allowing students to make outside contacts involving responsibilities is possible to practice in most of the shops of the high schools of divisions 10–13 of the District of Columbia. This policy supplies the students with added experiences that are somewhat different from traditional practices and affords an opportunity for the development of an understanding of the extent to which their task or undertaking meets the needs and desires of others. For example, an advanced student in printing, by first contacting those desiring to have certain pamphlets printed, experiences the exchange of ideas regarding the proper paper to be used, the general design and arrangement of certain sections, and the time of completion required for the job. By contacting paper dealers he has experiences which add to his technical knowledge regarding the kinds of paper suitable for the job, the cost of the paper in various bulks, and the like. In the light of these and other similar experiences, together with the guidance of the teacher he is able to consummate a satisfactory completion of the job. This procedure is possible in all of the industrial arts and is especially applicable to advanced and vocational students. As an illustration of the possible organization of such an activity program, the vocational students in shoe work at Armstrong were organized in four groups to rotate activities in the following manner:

Group 1. Responsible for receiving all student work, estimating and collecting costs of materials, adding up material costs and banking the same daily in the school bank, making out and filing daily reports, and adding up, checking, and paying monthly bills.

Group 2. Responsible for issuing all materials and tools from the stockroom, checking up daily and ordering the needed leather findings, going to leather stores and selecting and ordering materials, receiving, checking, and placing in the stockroom.

Group 3. Responsible for the supervision of the use of all outsole stitchers (any part when out of order to be reported immediately); for all work done on the outsole and upper stitchers, and for the proper setup of all jobs to be done on the stitchers, and for the care of, adjustments, and oiling of all stitchers and sewing machines.

Group 4. Responsible for the supervision of the use of all finishers, for the proper finishing of all jobs, for final inspection of all work for possible flaws, for issuing of finished work directly to the student customers, and the general care of all finishers, including sandpaper, cleaning brushes, changing covers, and oiling.

For the school year 1934–35, this shop made over forty pairs of shoes and did 2,723 jobs, on which there were material charges. The cost of materials used for these jobs was $835.85, and the materials were bought from three different firms, in order to give experiences of selection. It is obvious, therefore, from the analysis of the functions of the foregoing four groups, that the policy of allowing direct contacts on the part of the students involves an activity program which calls for close guidance on the part of the teacher and has definite possibilities for developing all of the proper attitudes which should permeate the learning processes.

Subjective Measures of Shop Conduct.[11] The practice of building up in students of the industrial arts, a staunch adherence to right principles and personal desires for proper conduct, involves many subjective methods in the conduct of shop activities. Among other things, there is required a broad understanding of adolescent psychology on the part of teachers in order to create a mutual confidence in, and respect for, doing things right. The policy of having students merely designate their reasons, on a chart for that purpose, for using the pass in leaving the room, of allowing them certain equipment of the shop and general toolroom; of the use of an open-chart method of partial self-grading; and of conferring with groups of students regarding the solution of certain shop problems, are illustrative of subjective measures of shop conduct. Such practices tend to build up in the students a philosophy of social understanding that doing things right have their own reward in life.

Objective Measures of Shop Conduct. Though shop teachers may strive, through the subjective methods, mentioned in the foregoing, to build up the proper habits that tend toward the development of right attitudes and ideals in life situations, there are certain objective methods that are essential to a well-ordered and disciplined

[10]William H. Burham, *The Normal Mind* (D. Appleton & Co.), Chaps. VIII, X, XX.

[11]Southard, Lockett and Black, "Shop Management. Controlling Theft in the School Shop." INDUSTRIAL ARTS AND VOCATIONAL EDUCATION (Feb., 1936), Vol. 25, No. 2, pp. 55–58.

shoproom. The following are illustrations of objective policies. The practice of stamping all tools with the shop monograms, arranging an orderly stock and toolroom with designated places for all tools and materials; providing special locks for both the shop- and stockroom; and such objective measures are analogous to locking one's car and home in actual life. It is through experiences in observing and helping to carry out such practices that students develop a social understanding pertaining to orderly arrangements and proper respect for law and order in the community.

While these few policies and practices which have been briefly outlined and explained are by no means all that are used in the conduct of the various shops, they are suggestive of those which particularly pertain to the development of the proper attitudes and ideals which should permeate the learning processes connected with the industrial arts.

According to Smith:[12] "Skills, informations, appreciations, and attitudes (doing, knowing, feeling, acting) — these are the wares or duties of every teacher. They are unavoidable responsibilities of industrial teachers."

Summary. To summarize briefly, this article indicates a unit of instruction in each of the subjects of the industrial arts together with the corresponding skills, technical knowledge, and social understanding resulting therefrom, as an illustration of the steps involved in character formation. It also indicates certain influences of the past, affecting the practice of emphasis on the development of social understanding. An analysis of certain practices and policies of teachers of shopwork that affect this developmental phase of education is outlined to illustrate the present tendency regarding the development of proper attitudes and ideals.

Conclusion. The data of this chapter, while not complete, suggest the following conclusions:

1. That the industrial-arts teacher analyze closely all of the units of instruction in connection with the relationship objective of *reason for doing*.

2. That more emphasis than has been given in the past, be placed on the teaching of habits that tend toward the development of proper attitudes and ideals.

3. That the possibilities of an activity program, which would permit of as many outside contacts as possible, under supervision, be closely analyzed in the light of the concept of habit formation through the development of attitudes and ideals.

[12]Homer J. Smith, "Four Distinct Duties," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION (Dec., 1934), Vol. 23, No. 12, p. 369.

The Public Must Be Told

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How to publicize the industrial-arts offerings of a school system.

"They cut out my department."

That was the lugubrious tale of many a good industrial-arts teacher returning during the depression years to his alma mater to see if any new jobs were opening up. Or his department was cut down, letting out a teacher or two. School boards were not to blame. They had reduced budgets; they had to bring about rigid economies. Cutting salaries sometimes sufficed, but more often they had to look about for some service, some department that could be curtailed or discontinued. In their deliberations, they came upon the industrial-arts department. Here was one that could go. Frequently members of the community suggested its curtailment. It was expensive; it was not college preparatory; it was not essential to education as popularly conceived.

Here precisely was the rub. For two generations industrial-arts studies had been making their way in American schools — ever outward from cities to smaller communities, and ever upward and downward in the school structure. They had gained in prestige and consolidated their gains — largely because of the vision of a few leaders of industrial arts and the progressive educational thought of school executives. For two generations gains had been made — within the schools. *But* the public was not taken along. Industrial-arts teachers were mainly content to learn their shop skills and to teach. They accepted their designation as a sort of postscript to the public school, interesting and useful, but a postscript nonetheless. When the public looked askance at this new growth, teachers did not gather their resources and set about proving through every available means that their studies were at the very heart of modern education. Instead they sat back, most of them, and let principals and superintendents make the few explanations that were made.

The public did not know what it was all about. From time to time, John brought home a footstool or a magazine rack and exhibited it proudly as something he had made in school. Father looked up from his paper and grunted approval of the workmanship — not that it was extraordinary, but that it was good for John. Father saw an exhibition now and then at the school, dragged there by John and mother, and he agreed with mother that some of the things were "pretty fine," but he wondered how they had time to do such things with all the necessary work they had in high school. Mother could not explain, nor could John. The teacher didn't bother. The principal was content to have his total school approved. The superintendent had a few formless theories of the values of industrial arts, but gave most of his interpretative efforts to what he understood better — the college-preparatory work.

The depression came — and with it the unhappy results already suggested. Not altogether unhappy, however, for out of the lean years came the conviction to industrial-arts men that they must prepare themselves to interpret their field of study to the community. They understood that they must convince father and mother, other teachers, growing boys, and the man in the street that industrial arts as now conceived and taught are not on the margin of education but are a vital and fascinating part of the mental and physical growth of every boy — and even a part of the education of girls. They learned that an annual exhibit of handiwork would not suffice, that, unsupported by adequate explanation, it might serve only to engender misunderstandings. A few of the better teachers have accepted the challenge in full; they are saying in substance, "We must know how to interpret these activities and their attendant values; we must be journalists of industrial arts."

That is the burden of this article. Industrial-arts teachers must learn how to report the fascinating facts about their departments and the work of the pupils. The facts will not report themselves, yet they have a natural advantage over those from the older, less spectacular departments. Every week will find something unusual made or attempted in a good in-

dustrial-arts department. Here is a boy who is working on an astronomical telescope. The story of his interests, his plans, his painstaking work will read like an adventure tale to even the weariest newspaper reader. And it will pave the way for explanations of the department's aims and methods.

Model boats or airplanes may provide several feature articles. So will most of the plans or products of progressive departments. Safety education will never fail to interest all readers if it is written of concretely and energetically. Changes in attitudes of boys, or growth in skills, or forming of character should not be overlooked as news of feature possibility. Hobbies are always good for reader interest and are the peculiar realm of the industrial-arts department. Co-operative work in building stage scenery or equipment, or educational display boards such as one made by an industrial-arts department in Hershey, Pa.,[1] or assistance in planning and preparing exhibits or demonstrations should be the occasion for articles showing how the work functions throughout the school in life situations. The man who trains himself to catch the significant activity as it happens and to report it in lively style will find no dearth of material.

Though space will not permit much illustration, headlines and parts of several news stories are included to suggest the variety and interest possible in industrial-arts reporting. Examples of both straight and feature news are given.

CAN'T, HUH? STARLING BOY DIVES FOR "UNRECOVERABLE" TOOLS

Ninth Grader Explores Scioto Bottom; Will Try Once More

Not many people in Columbus can give a working description of life beneath the blue-green waters of the Scioto river but Arthur Newland, 9B Edison-minded student, knows all about it. He has seen and explored the river bottom.

How? Well, Art was told by a foreman on the Main street bridge project that "there's a lot of good tools down under the water but there's no way of getting them." . . .[2]

PARENTS VIE IN HOBBIES

Adults Have Rediscovered School, and There Make Many Odds and Ends

By Pauline F. Geffen

"I'm so glad you like it. I made it myself." In the old days the hostess might have referred in this fashion to the cake which she served to her guests. Today she is more likely to refer to the tray on which she presents her cocktails, to the inlaid chessboard on which she plays with you after dinner, to the bookcase in which she keeps her first editions, or to the very bindings of her choicest volumes. For if she is a parent, she probably is going to school and learning how to make all sorts of things with her hands.

Parents have rediscovered school. They have found there a haven of hobbies. In the evening, while the youngsters are at home struggling with their lessons, fathers and mothers rush to the workshops their children have vacated, to take their turns at the easels, lathes, and looms.[3]

The cabinetwork that will be on display is of the highest workmanship obtainable of high-school students. Some of the projects that will be shown are: Beds, cedar chests, chairs, corner cupboards, tables of all kinds, lamps, desks, and many other projects.

Two projects of particular interest to be on display are violins made in the shop and patterned after a famous Stradivarian model.[4]

SHOP STUDENTS MAKE ARTICLES OF FURNITURE WITH NEW EQUIPMENT

The shop department is well pleased with its new table saw and power planer, recently purchased, according to Mr. Carleton, wood-shop instructor. "Work can be speeded up considerably with the aid of these machines," he said.

"Several fine articles of furniture are being finished in the shop," stated Mr. Carleton. "Foremost among these are a chest, by Jack Wenberg, which completes an entire set for his bedroom, two chests of drawers by John Stoner, a tile-top coffee table by Peter Merrill, and a bed by Clark White, which will complete a set for his room. Bertram Darr is reducing a double bed to a single bed, and Tom Tinker is making a wardrobe chest for his sister."[5]

SHOP CLASS HAS INTERESTING STUDY

Wood Turning, Inlaying of Veneer Comprise Two Present Units

Wood turning and the veneer inlaying of cabinet articles with various types and colors of woods comprise the junior course of industrial-arts work.

Junior shop students have constructed boxes varying in size and shape, and are now practicing inlaying them with thin woods called "veneer." Some of the boxes are as small as nickel matchboxes, whereas others are as large as miniature chests.

Due to the fact that the veneer is but one sixteenth of an inch in thickness and cracks quite easily much patience must be exercised on the part of the craftsman.

Construction of a box is necessary before the inlaying begins. Then the student must decide as to what design he shall use when inlaying his box. Next comes the color scheme.

It is essential that the color and grain of the veneer harmonize. A little patience and originality are all that is needed to construct an attractive piece of art, according to M. A. Neudecker, instructor.[6]

Essential to the success of the venture at interpretation is a program. There must be some unity, some pattern to the series of articles that are written, whether for public press, school paper, or other publication. The department head or teacher should first outline the main facts that should be told and understandings that should be developed. He should decide tentatively what phases of the work will be productive of news stories, what might have supplementary explanation through exhibits or demonstrations, what might best go to parents and public through mimeographed letters, circulars from the printshop, or other similar devices, and what might best be told through reports of the principal or superintendent. He should study picture possibilities, knowing that pictures have ever-increasing news value and are a power-

[1] See "Display Board of Educational Activities in Hershey, Pa.," *Industrial Education Magazine*, Vol. 37 (November, 1935), p. 272.

[2] Columbus *Despatch*, Sept. 25, 1936.

[3] New York *Times*, Feb. 16, 1936.

[4] Cincinnati *Times-Star*, March 17, 1937.

[5] Sequoia *Times*, May 12, 1936. (Sequoia Union High School, Redwood City, Calif.)

[6] The *Ah La Ha Sa* (Central High School, Albert Lea, Minn.), March 10, 1936.

This type of picture helps to interpret an article

ful aid to interpretation of activity. Some news he will make deliberately to fit his program for this year.

If he is not already trained sufficiently in the writing of news and feature stories, he must be willing to spend some hours studying forms and practicing. He will cultivate terseness and concreteness. He will learn to catch the most interesting fact and place it in the first paragraph, so arranged that it will catch the interest of the reader immediately. To sharpen his style he will use specific verbs and nouns rather than adjectives, and to produce liveliness and clarity, he will shorten his sentences. He will try to remember always that he is writing for laymen, and he will attempt to make all explanations clearer by specific words or revealing examples. In short, he will learn to write for the man who runs — simply, to be read rapidly, understood completely, and, if possible, experienced emotionally. The best newspapers will serve as his models.

As often as possible, he will use pictures to help tell the story. Most newspapers are glad to run a picture, if a good gloss print is provided. Editors know that readers will be more interested. Indeed, they say a cut is worth a thousand words. High-school papers, house organs, annual reports, bulletins alike require a journalistic style of writing — and good pictures. Teachers and pupils as well as the public must be won to understanding and approval of industrial arts. Therefore, every type of publication must be used and used consistently. Moreover, industrial-arts pupils should be taught to see news in what they are doing and to report it to high-school newspapers. The whole school, and back of it the community, must think and talk industrial arts when they think and talk of public education.

For the teacher who has never attempted interpretation through the written word, the task ahead may seem a formidable one. That such interpretation is necessary, he will not deny. It is to be expected, therefore, that increasing numbers of enterprising industrial-arts teachers will train themselves to be skilled interpreters of their departments. As they become adept at seeing and explaining meanings, they will realize that their work is more fascinating than they dreamed, and their teaching will assume new dignity and purpose.

Philosophy and Objectives for Mechanical Drawing

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The duties of the drafting teacher analyzed and outlined.

Every teacher should have a general philosophy of education with a subject philosophy that integrates with the former. There should be little or no conflict between the two.

We cannot teach without a philosophy. Having this we set up objectives for teaching our subject matter. Without a philosophy, it would be difficult to know what to teach or how to select a curriculum. Having a philosophy, it is easy to justify the methods of teaching or the course of study used.

The educational system of the United States is inherited from an aristocratic society, yet we expect it to fit the individual for living in a politically democratic country. Naturally, then, our curriculum is constantly undergoing a revision because we do not have a positive social, moral, political, or economic philosophy. If we, as a group, believed in one type of control, then we would have a philosophy.

The teacher should have a broad general background of experience and should know the individual field to be taught. He should be familiar with the learning process and practice its principles. He should know child psychology. His educational philosophy should stimulate him to think. The teacher's philosophy will be personal. It will change as the person "grows" and changes. Change can be for the good or bad. The teacher should keep in step with the changing world.

The Wisconsin Philosophy

Some of the main thoughts in the Wisconsin philosophy deal with the growth of the individual; education as adjustment, ability to use habits, skills, data; transfer of training; open-mindedness; individual differences; child interests; self-directed activity; self-expression; the child-centered school; influence of a definite progress or effort; democracy and the limitations of the schools in education. How does mechanical drawing fit into this philosophy as an integral part of public education?

Growth of the individual. Mechanical drawing provides a well-rounded growth by co-ordinating the three phases of the individual, the physical, the intellectual, and the emotional. It promotes freedom of growth.

Adjustment to adult-life situation. The standards of mechanical drawing are, or should be, the same in school as they are in the industrial and commercial world. Tool processes and skills also should be the same. An attempt should be made to develop an active interest in the industrial life of today. Mechanical drawing harmonizes the concepts of education fitting for growth and adjustment.

Ability to use habits, skills, data, etc. Ability to do is most readily acquired through doing. Mechanical drawing provides the situations and the student is given opportunity to demonstrate his ability in skills, habits, and the use of data. This can be measured.

Transfer of training. Because of the opportunities presented by the subject of mechanical drawing, to develop habits and skills and to inculcate attitudes and ideals, there is a high positive transfer compared to academic subjects.

Open-mindedness. Mechanical drawing gives the student an opportunity to deal with concrete situations, material, tools and processes, to collect and examine data, to weigh evidence and to draw conclusions. This helps to develop open-mindedness.

Individual differences. Teachers of industrial arts and mechanical drawing were among the first to make practical application of the known facts about individual differences. These subjects appear to be peculiarly adaptable to the individually differing abilities of pupils.

Student interest. Mechanical drawing has a high appeal to the native interest of students. This provides a very favorable learning situation.

Self-directed activity. By developing the personal interest of the students, mechanical drawing provides a most effective

means for stimulating self-directed activity. By formulating his own plan of procedure, the student can visualize the goal that has been set, and check his progress toward reaching it. He gains the ability to do, and to know.

Self-expression. Mechanical drawing offers an opportunity for self-expression by encouraging choice of projects and procedures.

Individual progress. Mechanical drawing provides a situation for adapting the work to the individual's ability, so that every pupil may make some progress and know that he is making it.

Because of its many-sided relationships to so many fields of endeavor — mechanical drawing offers a unique opportunity to the student in school. Mechanical drawing is a *living* graphic language. It is constantly undergoing change. It is creative. It is the best-known language vehicle in the industrial world. It can fulfill the rigid requirements of the Wisconsin Philosophy of Education.

A Philosophy for Mechanical Drawing

The teachers of mechanical drawing in Wisconsin believe in the philosophy of learning by doing. They teach the boys the information and skills of mechanical drawing as a basic foundation. They try to stimulate the proper attitudes, ideals, and interests of the individual and group. They try to get the boys to think for themselves by working out practical problems. Self-activity in problem solving is their goal. They treat every boy as an individual problem to be solved. They use many reference texts with mimeographed instruction sheets to keep the course flexible. They encourage some co-operative enterprises. Problems of the students' choices and interests are welcomed, especially if the student plans and draws the project in school and makes it at home. *Example:* Airplane layouts for home construction. They try to develop muscular and mental co-ordination through participation in mechanical drawing. Generally, the results are avocational with a slight trend to the specialized after an exploratory period.

Specific Objectives

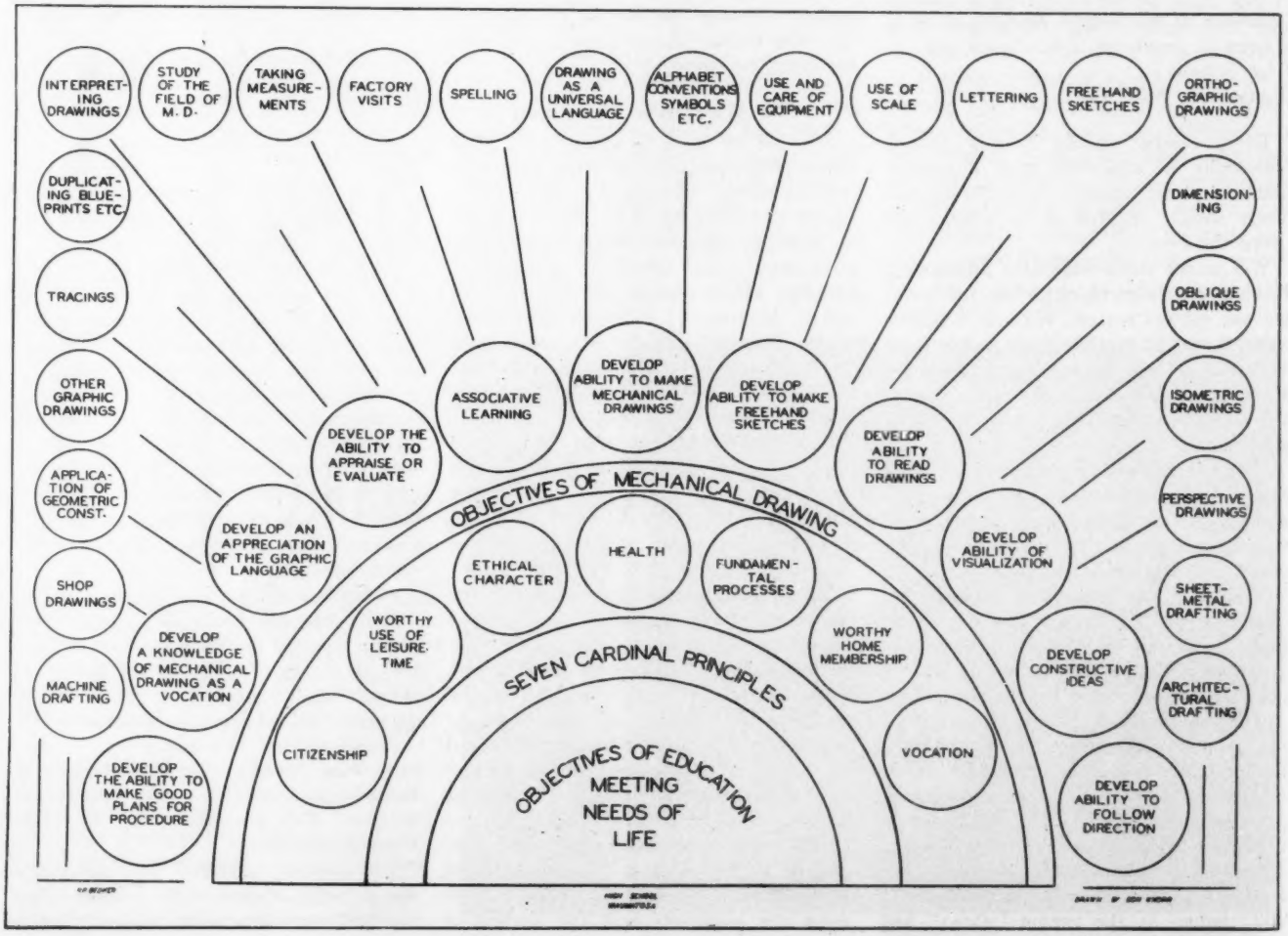
It is always well to know what one is shooting at. It is much better to have in mind a few worth-while objectives instead of a multitude of flowery, high-sounding goals. It is necessary to have the objectives so stated that the student understand their meaning. Understanding creates interest. Obviously it will be impossible for all students to attain all goals, but the goals should be just as clear to him, as is the bull's eye in target practice.

Some of the specific objectives that have been set up in mechanical drawing are:

Develop ability to make mechanical drawings. Mechanical-drawing courses should give such factual information and practice as is necessary to enable the student to solve drawing problems. He should know how to get facts by proper reference to authority. He should develop skill in making drawings, tracings, and blueprints.

Develop ability to make free-hand sketches. The student should be taught the value of free-hand sketches as a valuable adjunct to mechanical drawing. He should do practical work in making and working from free-hand sketches.

Develop ability to read drawings. A phase of drawing frequently overlooked is the reading of drawings and blueprints. If drawing is a graphic language, then the student should be able to read and interpret that language. The chances are that the student, after leaving school, will



be confronted with more situations in which he must read drawings than actually make them.

Develop the power of visualization. This means the ability to see in the mind's eye the house or bridge that is represented on a blueprint before it is constructed. It also means the ability to see the object before it is drawn. This can be measured by having the person describe and explain the drawing on a blueprint. If the student has the ability, have him make picture drawings of the orthographic working drawings.

Develop constructive ideas. This means the ability to work out drawing details. Some people have "visionary" minds. They can vision a dam across a canyon or a new design for an automobile but lack the constructive ability to work it out. Mechanical drawing is strong on constructive details.

Develop ability to follow directions. It is important in many lines of work to be able to follow directions. In the commercial field of drafting, the chief draftsman gives out directions that his assistants must be able to follow with little or no further explanation.

Development of academic skills as they relate to drawing. A person should be able to use the related mathematics, spelling, writing, and reading as it pertains to drafting.

Develop the ability to make good plans for procedure. The method of attacking a problem is very important. The student should be given an opportunity to make his plans of procedure. There are many ways to do a unit of work. A number of them may be equally good. Working according to a plan conceived by the student makes the problem more interesting to him.

Develop a knowledge of mechanical drawing as a vocation. The student should know some of the vocational opportunities of mechanical drawing. Both advantages and disadvantages of drafting as a vocation should be discussed. The idea is not to sell mechanical drawing to every student, but to give him a perspective of the occupation. He should understand its relationship to other fields.

Develop an appreciation of the graphic language. It is difficult to teach appreciation directly in any subject. A student by participating in drafting will develop a realization of the opportunities and shortcomings of the field. He will know the trials and tribulations of the worker. If the work is unduly hard for the student, he may develop a keener appreciation of the work of the draftsman. By his work in the classroom, the student develops some sort of attitude, which determines his appreciation.

Develop ability to appraise or evaluate. Giving the student an opportunity to check drawings under the supervision of the instructor will aid in developing an appraising attitude. Another method is to bring in drawings from the commercial field and have the students critically evaluate and rate them.

Associate learning. This is any type of incidental learning that is valuable to the child. Much can be accomplished by developing an inquiring mind.

Science Applied to Teaching

Teachers must use scientific methods in reaching their objectives. Science has a very simple rule, which also can be applied in teaching. The first thing to do is to measure the existing results. Second, modify the situation under controlled conditions. Third, measure the new results obtained. Continue this process until the desired goal is attained. This does not mean that things must continually be done in a different manner. Make only such changes or modifications as are necessary to reach the desired goal.

The experimental attitude in teaching. Progressive teachers have the experimental attitude. They are willing to try out new ideas, new plans, devise new methods and under controlled conditions watch patiently for results. The progressive teacher is ever studying with an open mind. He wants to learn something new. He is critical. He is systematic in his procedure. There is a grave danger, however, of making experimentation an end in itself. Use it only to improve instruction and the products of learning.

Survey the products of learning. A survey to determine the products of learning in any course is essential. The accepted products of learning include abilities, knowledges, skills, attitudes, ideas, and ideals acquired by the student. They may be social, moral, mental, or physical. The survey should show the efficiencies and deficiencies of the course. After locating the shortcomings of a given course in mechanical drawing, the teacher should locate what caused them. Causes of poor work will usually be found in the subject matter, in the pupils, in the teachers, in the method of teaching, in the instructional material, or in the environment. There are many causal factors under each of the above. For example. Under teaching we would include: The teacher's philosophy and objectives, selection of subject matter, proper motivation, provisions for individual differences, supervision of study, origination and supervision of classroom activities, measuring results, diagnosing causes of poor and good work, reteaching if necessary, and improvement of the teaching technique.

Measuring instruments. All measuring instruments should be made as valid, reliable, and objective as possible.

Measuring the results of teaching. It is important to know the progress made in any field of teaching. The measuring equipment now used is not always scientific, but it is better than no measurement. The teacher must strive to devise ways of improving present measuring equipment.

Co-operative democratic teaching. This means the working together of principals, supervisors, teachers, and students in developing improvements in classroom work. Democratic teaching requires that individual personalities and ideals be respected. The supervisor must respect the teacher, and the teacher the student. If dogmatism can be eliminated from the teaching process, initiative and responsibility will be hugely encouraged, and in that way the products of learning will be increased manifold.

A Ninth Grade Mechanical-Drawing Scale

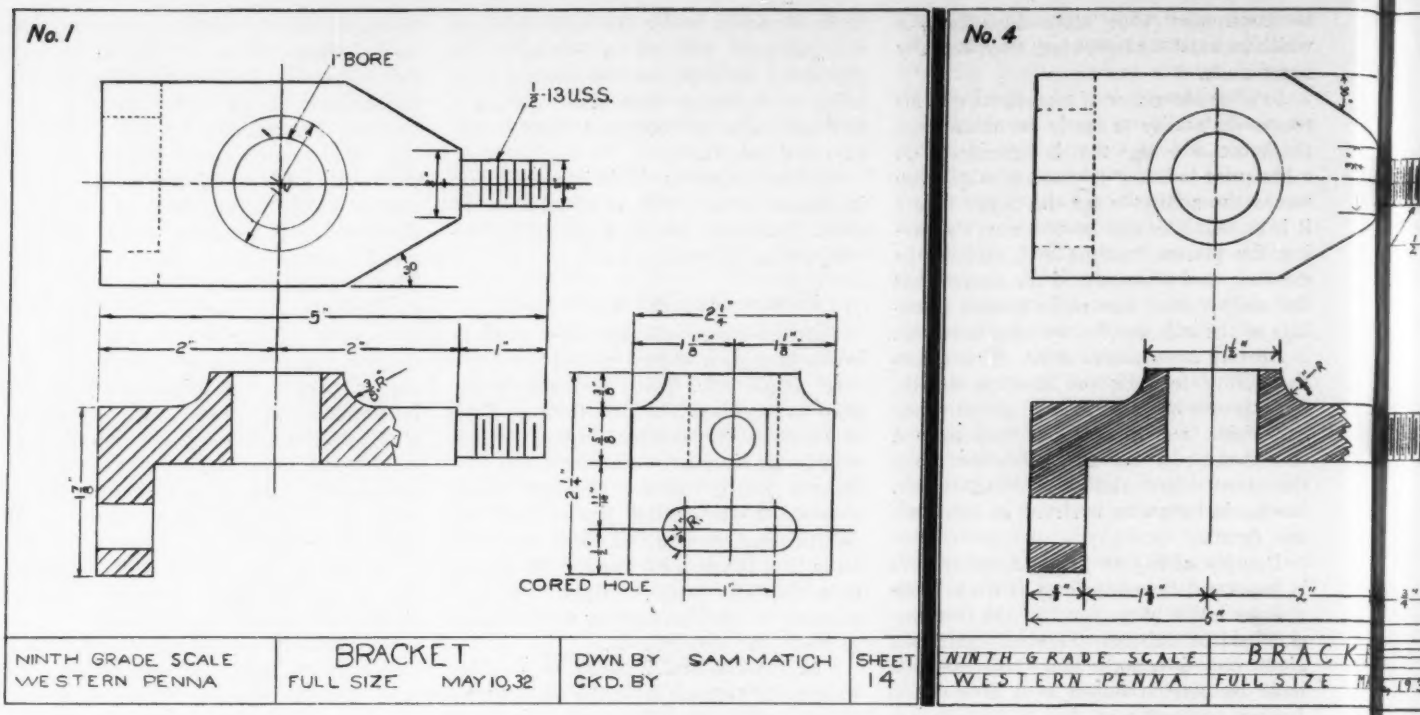
Wilbur K. Monks

Carnegie Institute of Technology, Pittsburgh, Pennsylvania

This grading scale for ninth-grade industrial-arts mechanical drawing was constructed in partial fulfillment of the degree of master of arts at the University of Pittsburgh, Pittsburgh, Pa.

The purpose of this study was to construct an objective scale, patterned after the present accepted forms of handwriting scales, which would be useful to mechanical-drawing teachers and their pupils for grading ninth-grade industrial-arts drawings. The study was confined to western Pennsylvania.

In order to determine the elements of mechanical drawing being taught in the ninth grade, letters were sent to all districts in western Pennsylvania, asking for sample drawings made by ninth-grade pupils. These drawing were then analyzed



Part of William K. Monks' grading scale, showing the b

and, on the basis of this analysis, the mechanical-drawing problem shown in the scale was developed.

Each co-operating instructor then received the number of drawing papers requested, a copy of the problem with instructions for each pupil, and a sheet of specific directions for the instructor. In this way, 540 drawings were obtained from 60 instructors. These drawings were given code numbers and all drawings were used by the judges in the construction of the scale.

The judges were selected from among those who make drawings, use drawings, and teach drawing. Seven judges were used for the first sorting, six of them also acting at the second sorting. All of them were chosen because they were considered competent on the basis of experience, training, and position. The judges, in this study, used as their criterion the usefulness of the drawing if it were handed to a workman with instructions to make the object.

For the first sorting, the entire group of 540 drawings was given in turn to each of the seven judges. Each judge was asked to separate the drawing into seven piles which would represent, as nearly as possible, equal steps of quality or excellence. The sorting of each judge was recorded and the drawings thoroughly shuffled before being delivered to the next judge. By means of the data thus collected, the papers upon which fewer than three judges agreed were then discarded. This left 380 drawings for the second sorting. Since this number was unnecessarily large, the next step was to throw out all drawings having incomplete title strips; fewer than three views; essential parts of a view omitted; one over-all dimension omitted; sectioning omitted; or those in which the notes, cored hole, 1-in. bore, and ½-13 U.S.S. had been omitted. This process eliminated 292 of the drawings, leaving 88 for the final sorting. Again the judges divided the drawings into seven piles, arranging each pile with the best drawing at the top and the poorest at the bottom. From this final sorting, the paper which was nearest the median paper in each group was selected, and the drawings were mounted horizontally in such a way that No. 1 shows the best sample and No. 7 the poorest. The illustration which accompanies this article shows the first, fourth, and seventh, as they appear in the scale. For use in the classroom, the scale should be readily accessible to both teacher and students. This scale is essentially a grading device and is not adapted for use as a means to be used for analyzing pupil difficulties in drawing.

To measure a specimen drawing, compare it with each sample of the scale in turn until the one is found which is most nearly equal to it. Each instructor can interpret the grades of the various samples in the scale to conform with his own system of marking, thus obtaining a usable method of grading the drawings which are produced in his classes.

Lessons for Young Workers—VII

Thomas Diamond

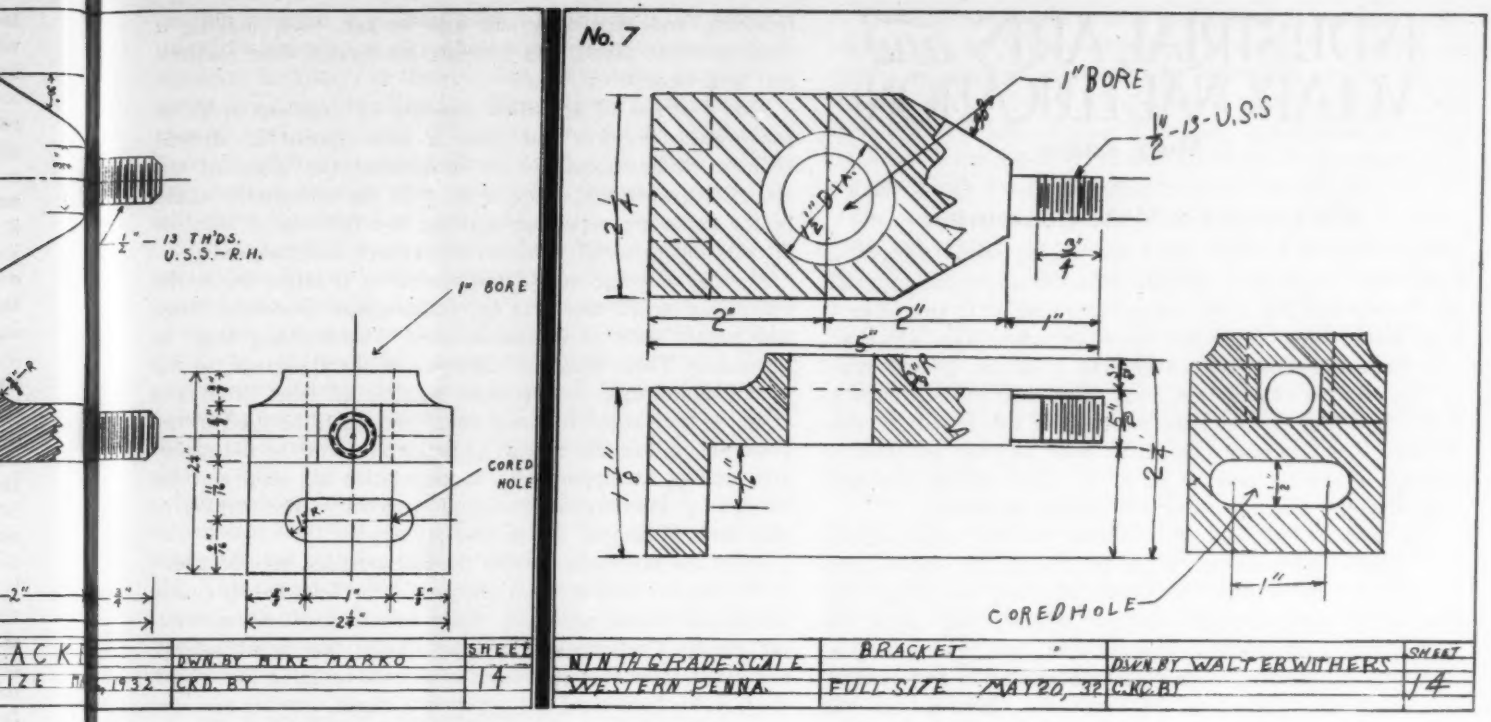
Vocational Education Department,
University of Michigan,
Ann Arbor, Michigan

The seventh of a series of suggestive lessons designed to help students of industrial arts and vocational education.

The Invention of New Machinery

Every year new machines are being invented, each one of which does the work done formerly by a large number of men. When the pyramids were built thousands of men were needed to raise the huge stones over inclined platforms to the places they were to occupy. By the introduction of the modern crane large stones and huge steel girders can be placed in position in a building with little effort on the part of a very few men.

Another illustration of this is found in the textile industry. In former years, a



ale, show he best, median, and poorest drawing on scale

man or woman was needed for the manipulation of each loom. The process of weaving was extremely slow and laborious, with the result that the amount of cloth turned out by a weaver was small. Today one operator can take care of six or eight modern looms, each one of which moves at an incredible speed and turns out an enormous number of yards of cloth each day.

The automatic machine which may be found in most modern machine shops today is another example of this. As the name indicates, the work done on these machines is done automatically; all that is required of the worker is that he keep the machine supplied with material. By this means the machine will turn out in one day as many articles as could be turned out by fifty men if they worked by hand.

Some workers believe that the introduction of these machines has robbed them of their jobs and, as a result, they are strongly opposed to the introduction of more efficient methods of doing things. These people forget that as the number of articles turned out in a given time increases, their cost decreases. As a result of increased efficiency, and automatic machinery, it is possible to purchase a Ford car at a price far below what it would cost if it were built in the old, laborious way.

Another illustration of this may be found in the common Ingersol watch which so many people carry. By means of automatic machinery it is possible to stamp out the parts for these watches at a low cost and to sell them at a price which is within the means of poor people. This would not be possible if each watch were made by an individual worker.

No one would want to travel from New York to San Francisco in a stage coach. Most people would prefer the modern trains with their large, powerful locomotives. Has it ever occurred to you that the introduction of these same locomotives caused the driver of the stagecoach to lose his job? In spite of this there are few who would maintain that there was less work to do in the world as a result of the change.

If one considers the matter carefully it should be clear that although the introduction of a machine may eliminate some jobs, it also provides many others. In the first place the machine must be made, which causes many workers to be employed. Again there are an infinitely greater number of articles turned out each year with the result that many more people must be employed to secure the raw material, turn it into semiraw material, and finish the articles after they leave the machines. The increased number of articles produced necessitates a larger sales force, and the sales they make entail larger transportation facilities with a corresponding increase in the number of men engaged in transportation work.

In conclusion, therefore, let us remember that:

1. The introduction of modern machines eliminates some jobs.

2. It provides work for more people in a number of other fields.

3. It enables the manufacturer to make articles at a cost which brings them within the means of poorer people.

4. The invention of machinery has raised the standard of living to the extent that poor people today have come to consider as necessities many conveniences enjoyed only by the wealthy a generation ago.

Questions for Discussion

1. What trades or jobs do you know of that have been eliminated by the introduction of machines?

2. Were the workers able to find other jobs?

3. Did the employer put in these machines merely for the purpose of firing the workers?

4. What other reasons may he have had?

5. How might the public benefit from the change?

6. Would we be better off if we abolished the use of cranes and returned to the methods used in building the pyramids?

7. What effect would this change have on conditions in the world? Would it provide work for more men?

Honest work, both mental and physical, provides participation and develops habits that are clearly moral. There is rather general agreement today that the most pressing need is not a book knowledge of what is right and wrong but actual participation in the elements of good citizenship. — *F. Theodore Struck, Ph.D.*

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

The Coming A.V.A. Convention

There should be little need for urging shop teachers to attend the American Vocational Association convention which will be held this year in St. Louis, November 30 to December 4. Wide-awake shop instructors know the advantages which accrue from attendance at conventions. However, all too many of these teachers cannot get away from their duties, much as they might like to attend the meetings of this important convention. It is necessary then, that those who can get leave of absence be doubly sure to be at St. Louis during the days scheduled for this important educational gathering.

The scope of the subjects covered at this convention is very broad and contains much of interest to anyone who is active in the fields of industrial arts and vocational education. The sectional meetings, for instance, will cover the agricultural, commercial, industrial-arts, industrial-education, part-time, teacher-training, vocational-guidance, and rehabilitation groups. There will be inspiration, information, and thought-provoking discussions for all. The convention, in itself, will be much worth while. Besides this, the city in which the convention is to be held, possesses rich historic, civic, artistic, industrial, commercial, and educational offerings which will delight and interest visitors.

A visit to Washington University, under whose auspices Calvin Milton Woodward opened the Manual Training School for boys in 1880 may intrigue many who are interested in the early history of the industrial-arts movement in America. Then there are the St. Louis University, the Herbert S. Hadley Vocational School, the David Ranken Jr. School of Trades and many other elementary, prevocational, vocational, and high schools, as well as two junior and two teachers colleges, all of which will offer opportunities for observation and study to those so minded.

St. Louis and the American Vocational Association have extended their invitation — it is now up to the individual to help himself and his profession by attending.

Seasonal Activities

Progressive shop teachers are always on the lookout for opportunities to tie up their work with activities that go beyond the confines of their classrooms. J. H. Dillon, in the September, October, November, and December issues of the 1931 volume of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION presented some very well-developed plans on how to tie up the home and the school shop. In these articles he gave a monthly list of needed seasonal jobs for the boys to do, such as putting the lawn hose into winter storage, making necessary repairs to the pipe covering on the heating system, cleaning up and storing the lawn mower and other garden implements, taking off and making necessary repairs on screens and screen doors, weatherproofing basement windows, insulating the water system, pruning bushes and trees in the garden, getting the home workshop in order, cleaning up the yard, taking down awnings, making needed ventilators for bedroom windows, oiling up door hinges, making flowerpot holders, repairing and repainting old and broken toys, making a Christmas-tree stand, and building birdhouses, bird shelters, and bird feeders.

This fine list of activities contains an excellent array of worth-while projects and gives a wide spread of student choices. Other incentives for broadening the scope of the school shopwork and tying it up with the community would be the gathering, repairing, making, and painting of toys for distribution to social agencies, orphanages, and hospitals.

Another activity, not so widespread as it might be, is the making of small dioramas to commemorate historical dates and events such as Columbus Day, Thanksgiving Day, or Christmas. These could be displayed in the classroom, in the school auditorium, in the show window of some prominent store, or they could be made small enough to be used in the home. Then, too, the revival of puppetry gives the industrial-arts teacher an opportunity to popularize his shop and his subject by assisting teachers and students in the making of puppets and puppet stages and scenery.

All of the jobs mentioned in the foregoing list may be added to the regular instructional content of the school-shop course as extracurricular activities. They furnish excellent material for Future Craftsmen's Clubs or similar boy organizations, and all of them provide opportunities for bringing the school, the boy, his home, and the community closer together and into a more co-operative spirit.

Things That One May Overlook

Man is prone to overlook the remote. Future happenings seem so distant that their influence on the present is lost. However, the fact that these remote happenings may occur with catastrophic suddenness, ought to prompt everyone to prepare for them even though they seem improbable.

The average shop teacher may never have pictured his particular classroom as the scene of a disastrous fire — a fire that may wipe out not only his own shop but an entire school building — a fire that may even be the cause of numerous deaths — deaths of children whom the shop teacher has known and loved.

To make this as personal as possible, it may be well for each reader to ask — what if fire were to start in my shop? Am I prepared to fight it, and if possible, to put it out before it can do much damage? Are there sufficient fire extinguishers in my shop? Are they properly located, easily seen, and readily accessible? Have they been inspected lately? Are they in working condition? Have I ever analyzed the fire hazards in my shop? What precautions have been taken to minimize them as much as possible? Have the students been thoroughly informed of the probable causes of fires due to spontaneous combustion? Have they been instructed in the proper disposition of waste material in the shop? Are covered metal containers provided for oily rags? Are provisions made to dispose of these oily rags before they can cause trouble? Are combustible and explosive finishing materials properly stored? Have the reliable students been instructed in the proper use of the fire extinguishers? Have all students been drilled in what to do should a fire break out in the shop?

Besides being prepared against dangers from fire, there is another eventuality for which the shop teacher must be prepared, and that is possible injury to himself or his students. Naturally, one of the most important requisites for the treatment of injuries is a first-aid kit. Such a kit ought to be ac-

cessibly mounted in a clean portion of the shop. Its contents should be inspected at stated intervals and replacements made whenever necessary, so that the first-aid material is ready for use at any time. Cleanliness in the treatment of wounds is of greatest importance, and this point must not be overlooked. Bandages that have rolled about on the shop floor, or that have become covered with dust, are no longer safe, nor are antiseptics that have lost their strength.

Some injuries, however, require more than a mere first-aid application. Have definite arrangements been made to take care of such probable happenings? Has a list been prepared giving the names, addresses, and telephone numbers of physicians who may be called in case of serious accidents? What preparations have been made to remove the injured person to a hospital or to his home? It is well to think about these things before being confronted with the necessity for immediate action.

Preparedness to take care of injuries should accentuate rather than deprecate the need for safety instruction. It should encourage the training of the students in the giving of first aid. This would really be a valuable addition to any shop course, and its inclusion would help to accomplish a very much worth-while objective of industrial arts and vocational education.

A Record of Our Industrial Civilization

From time immemorial, man has tried to perpetuate the story of his achievements, in one form or another, for the edification of succeeding generations. Some of these records are in the form of pictures scratched, graved, or painted on the walls of caves, others in the form of monuments covered with pictures and writing, still others are in the form of baked tiles into which records had been pressed or scribed, and in the form of written and printed scrolls and books. Besides this, there are the remnants of dwellings, palaces, and burial places that have come down to us in varying degrees of preservation picturing civilizations long extinct, and whetting the curiosity to learn more about the human beings who produced these relics.

It has been left to the ingenuity of the modern engineer, however, to devise a new and startling way in which the history of our civilization can be made accessible and understandable to succeeding generations in a manner most interesting and practical.

This planned scheme of perpetuating a record of our present civilization consists of a 7½-ft., 800-lb. torpedo-shaped shell of copper alloy known as *cupaloy* which has been designed as an indestructible envelope for the objects that were chosen to typify to future generations our method of life and our accomplishments. This capsule, carrying the story of a cross section of our civilization was deposited fifty feet underground on the site of the New York World's Fair on September 23, 1938, with the hope that it will remain there undisturbed for a period of 5,000 years. In its glass-lined inner crypt are thousands of pages of books, reports, and pictures photographically portrayed on microfilm. The receptacle also contains many articles that we use or wear, samples of our materials, textiles, alloys, seeds, and a newsreel made up of selected 1938 scenes of everyday life.

In order to make sure that future generations will be led to the exact spot where this unique historical capsule has been deposited, 3,650 copies of a descriptive book, designed by Frederic Goudy and printed on the most permanent paper known, will be sent to museums, repositories, monasteries, crypts, and various vaults all over the world.

As an aid to future translators there is included in the microfilm section a standard dictionary, a dictionary of slang, the *Fable of the North Wind and the Sun* in twenty languages, and the *Lord's Prayer* translated into 300 languages.

The information on our educational system seems to be somewhat meager. It consists of an introduction, the section on education from the *Encyclopædia Britannica,* and a copy of *All the Children,* which is the thirty-ninth report of the Superintendent of Schools, New York City. Probably the educator may wonder why this important section of our modern civilization was treated with such brevity. One would imagine future generations would be specially interested in this phase of human activity, for surely the training of the young is extremely important.

Taken all in all, however, this five-thousand-year time capsule will give future generations a picture of our civilization that is very much worth while. This effort to preserve historical data for the future also points out what we who are interested in industrial arts and vocational education ought to do for our own profession. Much of the developmental work which prefaced and accompanied the introduction of industrial arts and vocational education in our school system is already surrounded by the haze of oblivion. Many of the men who were influential in introducing and propagating this work have been almost wholly forgotten. For their sake, and for the sake of future generations, we who are interested in this type of education, ought seriously to consider a suggestion already made of preparing a repository or repositories where everything pertaining to our work could be gathered and preserved for the future.

Man advances by judiciously using and improving the heritages of the past. It is well, then, to preserve these heritages so that they are available to the fullest extent for future progress.

Safety Precautions

To make a school shop safe requires much thought, planning, and constant vigilance. There must, first of all, be an analysis of conditions as they are in the shop, and then a plan of what they ought to be. After that plan has been once formulated, it is imperative that the needed changes be made immediately.

In the inspection of the shop to determine what must be done to make it safer, the following list may be helpful:

What machinery is unguarded, or insufficiently guarded? What is the condition of the floor around the machines? Is it too slippery, rough, defective in any way?

How is the lighting? Is it of sufficient intensity? Does it produce glare, or does it cast troublesome shadows?

Are the machines located so as to avoid congestion? Is there sufficient elbow room for the operator? Are the starting and stopping switches easily reached? Are the machines grounded so that there is no danger of receiving a shock when touching any of the metallic parts?

Are workers properly instructed in the safe running of machines before being permitted to use them alone? Are the operators properly dressed for their work? Does the machine section of the shop receive sufficient supervision so that unsafe practices can be checked before accidents occur?

Distinctive Elements of the Industrial-Arts Program

James McKinney

Educational Director,
American School,
Chicago, Illinois

An outline for an answer to the question: "What can industrial arts do for a boy that cannot be done as well by some other subject?"

Industrial Arts — A Social Institution

The roots of industrial arts are deep in the soil of our existence, and with its fruit of language are the source of all our civilization.

1. *Man a tool-using animal.*

a) Without the invention of the tool and his ability to exchange ideas, man is just another animal.

b) The tool an extension of the man.

(1) Modern machine the same thing.

(2) Machine not deadening for the majority of workers.

c) Tool skill necessary for securing food, shelter, clothing.

2. *The invention and development of the tool* an intellectual activity of a high order involving:

a) Reflective analysis, research, experiment leading to invention.

b) Increase of scientific knowledge and facts about materials.

3. *The creation of utility* in goods by the aid of tools and intellectual and physical activity involving:

a) Skill and technical knowledge.

b) Ever-increasing knowledge of materials and their adaptation for making life richer and fuller.

Social Relations Found in Industrial Arts

1. *Industrial relations and outgrowth of work.*

a) Craft levels an outgrowth of work relations.

(1) Social distinction of laborers, apprentices, journeymen, craftsmen, masters.

b) Lines of authority and responsibility outgrowth of work relations.

(1) Workers, gang bosses, foremen, supervisors, superintendents.

2. *Types of group relations due to work relations.*

a) Good social relations result from efficient and friendly group co-operation in work.

(1) History of race shows long periods when people lived at peace and developed the arts of living.

b) Quarrels, fueds, wars result from maladjustments in trade and work.

(1) Wars responsible for slavery; slavery led to debasing of work.

Man's Adjustment to His Environment Through Industrial Arts

1. *Fundamental necessity for learning and teaching.*

a) Man not endowed like other animals. Comes into the world with capacities but no skills.

b) Skills of living have to be learned.

(1) Knowledge comes from experience but it must be developed and retained by reflection. New related to the old, but the old is ever-changing because of new additions to the background.

(2) Skills are really wisdom in action.

Two Processes Necessary for Man's Adjustment to His Environment

1. *The intake* (our heritage from the experience of the race).

a) Controls of life (skills, knowledge, intelligence).

b) Enjoyment of life (satisfaction from the study of the record of the race. Deals with literature, nature, personal relations).

c) Understanding of life (religion, science, history, philosophy).

2. *The output* (the carrying-on of experience and the new contribution of the present generation).

a) The individual applies the heritage of the race to the development of his own capacities, and through this development he is able to do the work of the world a little better than his forefathers.

(1) This is the one central or core idea which has permeated all races.

Today Industrial Arts Still a Large Segment of the Circle of Living

1. A man's work is still the center of his living.

2. His education and development are still largely controlled by his work. "Blessed is the man who has found his work. Let him ask no other blessedness."

a) School is only the fringe of living — a mere "twilight zone."

Industrial Arts the Representative of the World's Work Within the School Border

1. Its claim for representation in the school curriculum based on the fact that the industrial arts are necessary for the full development of the boy and of the man in terms of citizenship.

2. The school shop, a unique experience in doing, rather than book study.

a) Involves joy in working with tools, expression through concrete mediums, physical and mental self-activity, activities having their own end.

3. Industrial arts, skills, and knowledge are easily comprehended by the average boy.

a) Self-expression in making or doing.

b) Keenness in acquiring the skills.

4. For ages children have taken a part in the work activities of the home.

a) This type of experience a part of their heritage.

b) Children still vitally interested in people and their work.

c) The open shop door is still the center of interest for children.

d) The home, at least in urban centers, no longer provides the experience of the industrial arts.

e) The development of the mental, emotional, and physical life of children depends on the richness and variety of experience in the arts of living. Industrial arts provides this experience.

What Can Industrial Arts Do For a Boy That Cannot Be Done As Well by Some Other Subject?

1. Industrial arts introduces a miniature world to the boy in which he can find a complete cycle of living — in individual and group experience.

2. Industrial-arts teachers somewhat different in social outlook. Can see that a good builder, a good locomotive engineer, a good telephone or automobile repair man may be of as much value to society as a doctor, a high-school teacher, a politician, or a lawyer.

3. Student thinks in terms of concrete mediums rather than in abstract language.

4. Expression is in processes of shaping, construction, assembling, disassembling materials, rather than in words.

5. Opportunity to explore the industrial world and to use a variety of tools and materials in constructive activity.

6. Gives experience in the necessity of

orderly planning as a part of the process of making a shop project successful.

7. Opportunity to recognize that things which are made start as ideas and are developed by intellectual activity.

a) Real problem solving actuates dealing with the making of things.

8. Tools and materials have to be respected and handled in certain prescribed ways. This gives a unique character-forming experience not found in academic studies.

a) Discipline provided by the materials and the tools.

9. Discipline in doing unpleasant tasks which are necessary and cannot be shirked as they are part of the objective that gives satisfaction, as grinding tools, sharpening tools, cleaning tools and machines, sandpapering, polishing, etc.

10. Satisfactions from quantity and quality production of things.

a) Two distinct satisfactions and not equally shared by all people.

11. Pride and satisfaction from constructing something worth while.

12. Carry-over of skills and technical knowledge to the home, the home workshop, and the community.

13. Opportunity to engage in group work similar to real life situations through group projects.

14. Introduction to industrial planning and industrial organization through group projects.

15. A real appreciation of the skills of those engaged in industry as it is exhibited in design and construction, and an opportunity to see and feel industry as a social institution.

16. Ever-increasing knowledge of materials and their adaptation for making life richer and fuller.

17. Consumer values in material, construction, and design so far as they relate to shop experience.

18. New and different standards of approval which are more objective. The taskmaster in the role of measurements, fits, strength, standards, finish, etc. No real need of school grade to measure success. The "Go" and "No-Go" standards of industry. The airplane flies or does not fly, engine or motor works effectively or poorly, the radio works or does not work, the joint holds or fails to hold, etc.

19. Realization of the need for drawing and the making or drawings and their function in industry.

20. The use of hand and machine tools makes a natural setting for safety-first instruction.

a) Safety first a part of the instruction in making things involving the use of tools.

21. Book study necessary — a real asset in supplying information on how to use tools, types of construction, and materials.

a) A new point of view for the schoolbook. It is no longer a mere source of information which is checked by quiz or written examination but a real help to the student because it answers his questions concerning the *how* about something he wants to make.

22. Industrial arts is the one form of school experience that automatically provides for individual differences; it cannot be carried on otherwise. Self-activity is the core of its method.

23. Center of worth-while vocational guidance where opportunity is given for trying out courses in any trade or occupation.

24. All learning depends on the total attitude of the learner which includes his emotional reaction.

a) Industrial arts one of the easiest subjects to teach because the learner's emotions as well as his intelligence are in harmony with the learning process.

b) The industrial-arts learner is seeking to master himself in relation to his environment and the teacher seeking to help the individual find the method of mastery.

c) Academic teacher often has the difficult task of ensnaring the attention and interest of the student due to the subject being foreign to the natural interest of young people.

d) The time that the academic teacher spends in trying to build up values for certain subjects makes it look like a job-holding necessity.

25. Best teaching should be done in industrial-arts work but in many places it suffers from poor teachers, lack of appreciation of objectives, and poor supervision. The strictly vocational schools often make a better showing because of clear-cut standards and objectives, teachers who know the *what* of their job, and good supervision.

26. There is a possibility of industrial arts being the center of all educational activity for the elementary and junior high schools. Studies to center around the industrial arts as a social institution, and deal with studies in marketing, industrial processes, source and use of raw materials.

The Distinctive Value of Industrial Arts As Seen from the Boy's Point of View

1. A great relief from the monotony of book studies and classroom routine.

2. Often a real relief to meet a man teacher in the shop.

3. Satisfaction in working with tools and gaining tool skills.

4. Pride and satisfaction in ability to make something which he wants.

5. Satisfaction in working with machine tools.

6. Satisfaction in assembling and disassembling of machines or tools just to see "what makes the wheels go round."

7. The immediate use of shop skills and knowledge outside of the schoolroom in the pursuit of hobbies or other constructive interests.

8. Chances to see the industrial work of his community and learn how it functions.

9. An understanding of the how and why of mechanical drawing.

10. Joy in new types of group activities.

Which Should Be Stressed— Speed or Accuracy?

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A discussion of how the industrial-arts instructor can develop these two important elements in his students.

Here is a timely topic which is worthy of every shop teacher's consideration. No doubt the problem has already come to the instructor's attention, through occurrences like the following: One boy works slowly, does a good job of it, and gets only one project completed; another works much more rapidly, does only fair work, and completes three or four pieces; still another works at fair speed, and completes a couple of simple pieces with fair skill. The question is how to rate the accomplishments of these pupils, and do the job fairly.

One answer to the above question was given by Mr. Arthur B. Mays, Professor of Industrial Education, University of Illinois. Mr. Mays states that speed and accuracy are of *equal* importance, and that both should be *equally* stressed from the beginning. Mr. Mays goes on to say that if this is not done, then the instructor will at some later date have first to break down the counterpart of the habit he neglected to form, before he can teach the other desired habit. Thus, a boy who works slowly and painstakingly, will, before he can work rapidly, have first to break down his slow methods, and then

begin to learn to work rapidly. This procedure is evidently wasteful, and, if both habits are to be acquired, it would be wiser to teach them both from the beginning.

Another answer to the question was given by Mr. O. B. Badger, Director of Industrial Education, Tulsa, Okla. Mr. Badger states that in industry, accuracy and speed are of equal importance. The slow worker who is a stickler for accuracy is just as certain to be displaced, as is the one who works rapidly and is lax in accuracy. Consequently, Mr. Badger believes that in all shop courses of a vocational nature, accuracy and speed should both be stressed; that it will, in fact, be impossible to stress speed too much. Mr. Badger maintains further, — and these facts have been shown by statistics — that a rapid worker concentrates more than does a slow one, because of which the rapid worker is more apt to be accurate than the slow one. Further, the rapid worker, for the same reason, is much more likely to have regard for safety factors, than is the slow one. Both of these reasons are given, of course, as excellent arguments in favor of speed in industrial work.

In the industrial-arts field, in which the vocational objective is submerged in preference to the cultural or educational objective, Mr. Badger believes that speed may be relegated to a very close second place. There is a greater waste of time, Mr. Badger insists, than should be tolerated. He cites a case of a boy who was to saw off a piece of stock on the power saw, and drill the ends in preparation to mounting the work on centers in the lathe. Observing the boy, he was seen to stand idly by and wait while the machine did the cutting. He had made a previous trip to the toolroom for measuring tools; after the stock was cut, he made a second trip to the toolroom for a centering head and scratch awl, a third trip to return these and secure a center punch and hammer, and still a fourth trip to secure the center drill. After the holes were drilled he made a fifth trip to return the centering drill and secure a lathe dog and a faceplate. After he had completed the job, the boy was told how many minutes the job had taken. He was then asked to show how rapidly he could do it, when someone held a stopwatch over him.

There was an immediate difference. Having measured the stock, he put the bar into the machine and set it into operation. While the cutting was going on, he made his second trip to the toolroom, and secured *all* the tools that he needed. He placed the faceplate on the lathe, and laid the dog in readiness. He put the center drill into the chuck, and adjusted the drill-press table to approximately the right height. He opened the vise and laid out the tools in readiness to locate and punch the center. After the machine had finished cutting the piece, the remaining steps were gone through rapidly, and a third trip to the toolroom to return the tools completed the job in *less than half the time that had been required before.*

The important thing to be learned from this example, Mr. Badger asserts, is that a pupil can be made to improve his own record if *urged to do so.* Such items as drawing the margin and blocking in the views, in mechanical drawing; building a fire in the forge in metalwork; adjusting a plane, and squaring up stock in the wood shop; tinning the soldering copper in the tin shop; adjusting the stick in the printshop, are all routine operations, which, after the first instruction periods, ought to be done with more and more accuracy and speed as time goes on until a maximum of accomplishment has been reached.

Of course, it must not be forgotten that a beginner must first understand the procedure which he is to follow. He must have a clear conception of just what he is going to do, and how he is going to do it. There can be no doubt that when an operation is first performed, correctness and accuracy are of paramount importance, and speed is almost a negligible factor. Successive repetitions are, however, to be done with greater and greater rapidity, beginning — after a checkup on the first performance of the operation — with the *second* time that the operation is carried out. Thereafter a maximum attainment of speed and accuracy should be striven for, with as few repetitions as possible.

If it then develops that one or the other of the two is to be sacrificed, speed is the one that must be made the first to suffer. One reason is that habits of slowness can be more easily broken down — with some pupils, — and speed acquired, than can habits of inaccuracy be broken down and the habit of accuracy developed. Skill in manipulation can be acquired much more slowly than speed, in fact, a certain degree of perfection in skill must be present, before any degree of production speed can be hoped for.

It is easily possible that in industrial-arts work only a very few of the operations performed will ever be developed to the extreme point of either accuracy or speed. This is entirely in line with the objectives, and is due, of course, to the lack of sufficient repetition inherent in the nature of the instruction given and of the work done.

Another reason for allowing speed rather than accuracy to suffer — in industrial-arts work — is that the pupil and his parents will have to live with the project he completes, and be pleased and satisfied with it. The latter is much more apt to be the case, after several weeks from the time when the project is finished, at any rate, if the job is accurately and neatly done, than if it is not, and the pupil maintains that he "constructed it in less time than anyone else in class." A slovenly job rapidly done would do far more harm to the "cause" of industrial arts — and to the student — than would a slow job carefully and painstakingly done.

The fact still remains, however, in spite of the aforementioned points in favor of accuracy rather than speed, that there is much wasted time in the shop due to unnecessary slowness. The question is, what to do about it.

A glance at industry, again, reveals the more or less anomalous fact that here are men successfully working at maximums of both speed and accuracy. The laws of economy and efficiency see to that.

In industry the workers have all been weeded out, and each man has found the particular niche, the specific job, in which his particular capabilities and endowments are given at least a reasonable amount of easy and natural expression. In other words, the man finds pretty nearly the job that he is fitted for.

This is true far more nearly in industry and business, than it is in the public schools. In fact, only within the past few years has anything been said as to individual differences in the school, whereas industry has paid attention to this matter automatically since the beginning of civilization, no doubt.

Thus it is that the industrial-arts instructor has in his classes, even under the best circumstances, students who are considered on the same plane in school, but who, when they go out into the world, may potentially be as widely apart as are the poles. The problem is complicated, as every teacher knows, by individual differences in mentality, differences in mechanical aptitude, monetary difficulties and all its ills, lack of proper incentives, and a host of others that cannot be touched on here.

Thus, it is, too, that it would be impossible in a school shop to say, as is done in industry, that a certain operation, for example, squaring up a piece of stock, shall be done in so and so many minutes or hours, and within such and such limits of accuracy.

The best that has been done so far, in some of the larger schools, is to classify the pupils into groups according to ability — the upper fourth into the *A* group, the middle half into the *B* group, and the lower fourth into the *C* group, roughly according to the normal distribution curve. It has been possible, at least in the case

of the *common repetitive operations* mentioned, to establish graded norms or standards of achievement both as to accuracy and speed, for each of these three levels. Some of this sort of thing has been done, and beyond a doubt more and more of it will have to be done. It must be observed, however, that this applies to operations, not to projects. The difference is immense. And there is, then, no danger of our courses becoming hidebound or lockstep in type; no need of making the same projects year after year, although we *will* be using much the same operations year after year.

Granted that it is possible within certain circumscribed limitations to set up standards of attainment as to speed and accuracy, then the job begins to take on colossal proportions. What then must the shop instructor do?

He must:

1. Set up as many standards of achievement as he can find time to develop and apply.
2. Give the questions of speed and accuracy their proportionate amount of attention, at least enough so that the pupils will realize that both are important.
3. Instruct the pupils as to the place of speed and accuracy in industry.
4. Urge the pupils to strive continually to improve their own record; some to work for greater speed, others for increased accuracy.
5. Work up as many incentives as possible for attaining these ends, such as interest, competition, praise, progress charts, time cards, achievement standards, tests, grades, remuneration (for commercially valuable products), exhibits, contests, awards, ribbons, prizes, and the like.
6. Judge each pupil as nearly as one can on his individual ability and achievement.
7. Do the best one can, and stay cheerful.

Testing and Tests

Seventh-Grade Woodworking Test

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The test presented herewith was designed to be used as a final examination for a first-year woodworking class, which met for two 57-minute periods per week for 38 weeks. It consists of a true-false test of 50 items, a multiple-choice test of 20 items, a completion test of 20 items, a picture-identification test of 10 items, and a rearrangement test of 8 items.

General Directions: This test consists of five parts. Read the directions for each part very carefully. Do not waste any time. If you do not know the answer to a question go on to the next one. You will have 55 minutes to finish the test.

Part I. True-False

Directions: Below are some statements of which some are true and some are false. If in your opinion the statement is true place a circle around the T; if false, around the F. Fifty items, one point each.

T F 1. A No. 8 wood screw is larger in diameter than a No. 6.
T F 2. Medullar rays show more plainly on basswood than on oak.
T F 3. Stain is the same as varnish.
T F 4. Auger bits are numbered in sixteenths of an inch.
T F 5. Soap will make wood screws go into the wood more easily.
T F 6. There are 2 board feet in a piece of wood 1 by 3 in. by 5 ft.
T F 7. Shellac is thinned with turpentine.
T F 8. A saw may be sharpened with a file.
T F 9. A countersink is used for flathead screws.
T F 10. Oily waste should be kept in a metal container.
T F 11. No. 0 sandpaper is finer than No. 1.
T F 12. A plane iron is sharpened with a file.
T F 13. A jack plane is longer than a smooth plane.
T F 14. Varnish is thinned with turpentine.
T F 15. A plane may be set to take a deeper cut by using the lateral adjustment.
T F 16. Glue will stick to an oiled surface.
T F 17. A blueprint is made with blue paper and white ink.
T F 18. Common nails are made of lighter wire than box nails.
T F 19. A bench hook is used to help hold a piece of stock when cutting with a backsaw.
T F 20. A grinder should turn toward the cutting edge of the tool.
T F 21. An auger bit is usually held in a brace.
T F 22. A project should be assembled before it is sandpapered.
T F 23. A chamfer is the same as a bevel.
T F 24. Stain is used to protect the surface of the project.
T F 25. A claw hammer may be used to pull nails.
T F 26. We use a 2-ft. rule in the shop.
T F 27. An expansive bit is used for boring large holes.
T F 28. A try-square is the same as a T square.
T F 29. A 2-ft. rule is 23 in. long.
T F 30. When driving nails, the hammer handle should be grasped close to the head of the hammer.
T F 31. A ripsaw is used to cut with the grain of the wood.
T F 32. A wood chisel should be ground on both sides.
T F 33. White pine is a softwood.
T F 34. An eight-penny common nail is larger than a ten-penny common nail.
T F 35. Maple has a very open grain.
T F 36. Hammer handles are usually made of softwood.
T F 37. When a flat surface is being sanded, the sandpaper should be used on a block.
T F 38. A ripsaw tooth is larger than a crosscut-saw tooth.
T F 39. Paint is used to bring out the beauty of the grain in a piece of wood.
T F 40. Wood should be sanded with the grain.
T F 41. Oil is put on an oilstone to keep the tool from getting hot.
T F 42. A plane iron should be ground on both sides.
T F 43. Varnish should be applied with a brush.
T F 44. A countersink should be used for roundhead screws.
T F 45. Sapwood makes the best lumber.
T F 46. Surface planing is easier than end planing.
T F 47. The size of a wood screw is designated by its length in inches and gauge.
T F 48. Picture frames are usually made with miter joints.
T F 49. The wire edge is taken off a plane iron with an emery wheel.
T F 50. Auger bits are ordinarily used in a breast drill.

Part II. Multiple-Choice

Directions: From the several suggested answers which accompany each of the following unfinished statements, choose the best answer and place the number preceding it in the blank space before the statement. Twenty items, one point each.

.... 1. Brads look like small (1) finishing nails, (2) box nails, (3) casing nails,

(4) lath nails, (5) common nails.

.... 2. Lumber is usually sold by the (1) pound, (2) square foot, (3) board foot, (4) yard, (5) cord.

.... 3. Bench tops are usually made of (1) basswood, (2) pine, (3) maple, (4) walnut, (5) oak.

.... 4. Varnish should be thinned with (1) gasoline, (2) alcohol, (3) turpentine, (4) kerosene, (5) water.

.... 5. Shellac is thinned with (1) kerosene, (2) gasoline, (3) oil, (4) alcohol, (5) turpentine.

.... 6. Nails are usually driven with a (1) claw hammer, (2) mallet, (3) sledge, (4) ball-peen hammer, (5) cross-peen hammer.

.... 7. Finishing nails should be driven below the surface with a (1) countersink, (2) nail set, (3) awl, (4) punch, (5) another nail.

.... 8. A No. 8 auger bit will bore a (1) ¼-in. hole, (2) ½-in. hole, (3) ¾-in. hole, (4) 1-in. hole, (5) 1¼-in. hole.

.... 9. Hammer handles are made of (1) pine, (2) basswood, (3) oak, (4) hickory, (5) walnut.

.... 10. A countersink is usually held in a (1) drill press, (2) brace, (3) breast drill, (4) clamp, (5) vise.

.... 11. A tree gets most of its growth in the (1) winter, (2) fall, (3) spring, (4) summer, (5) autumn.

.... 12. A shellac brush should be cleaned with (1) gasoline, (2) kerosene, (3) alcohol, (4) water, (5) turpentine.

.... 13. At $100 per M, one board foot will cost (1) 10 cents, (2) 8 cents, (3) 5 cents, (4) $1, (5) $10.

.... 14. The age of a tree may be told by counting the (1) medullary rays, (2) annual rings, (3) knots, (4) limbs, (5) roots.

.... 15. An expansive bit is usually adjusted with a (1) screw driver, (2) hammer, (3) chisel, (4) block, (5) square.

.... 16. The letters "R.H.B." refer to (1) nails, (2) brads, (3) chisels, (4) glue, (5) wood screws.

.... 17. The best plane to use for jointing long boards is a (1) block plane, (2) smooth plane, (3) foreplane, (4) jack plane, (5) jointer.

.... 18. Nails are usually sold by the (1) dozen, (2) box, (3) gross, (4) pound, (5) hundred.

.... 19. Sandpaper is graded according to (1) letter, (2) number, (3) size (4) strength, (5) color.

.... 20. The part of a wood chisel that is placed against the grinder when sharpening it, is called the (1) shank, (2) ferrule, (3) bevel, (4) chamfer, (5) tang.

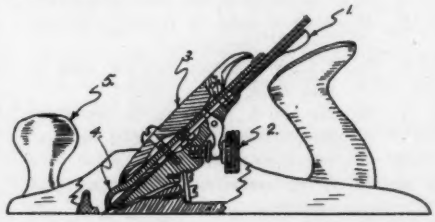
Part III. Completion

Directions: In the sentences which follow, there are certain words that have been omitted. Write the omitted word or words in the blank space. Twenty items, one point each.

1. Backsaws are sharpened with a (an) .....
2. Lumber is cut along the grain with a ..... saw.
3. Plane irons are honed on a (an) ....
4. The unit of board measure is called a .....
5. Screws are driven with a ....
6. The layer of a tree represented by one year's growth is called a (an) ....
7. A hand tool used for testing to see that the edges are at right angles to the surface is called a .....
8. $100 per M, means $100 per .... board feet.
9. Stain is used to ..... the wood.
10. Cracks in the ends of boards are called .....
11. A crosscut saw is used to cut .... the grain of the wood.
12. Nails are sometimes galvanized to keep them from .....
13. A lag screw is driven with a ....
14. No. 2/0 sandpaper is ..... than No. 1.
15. The abbreviation "S2S" in woodworking means .....
16. There are ..... screws in a gross.
17. A one-inch hole may be bored with a No. ..... auger bit.
18. Ten-penny nails are ..... than eight-penny nails.
19. The term *kerf* refers to a ....
20. Chamfers are ordinarily laid out with a .....

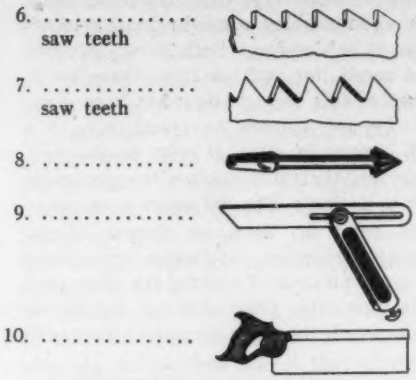
Part IV. Picture-Identification

Directions: In the drawing of the plane, which follows, the different parts are numbered. There is also a list containing more plane parts than are numbered on the drawing. Identify the numbered parts on the drawing by placing the proper number in the blank space in front of the name of the part in the list. Five items, one point each.



.... plane-iron cap
.... adjusting nut
.... lateral adjusting lever
.... frog
.... bottom
.... handle
.... knob
.... plane iron
.... lever cap
.... y adjustment

Directions: Identify the articles shown in the following drawing, by placing the proper name in the blank space. Five items, one point each.



6. ..... saw teeth
7. ..... saw teeth
8. .....
9. .....
10. .....

Part V. Rearrangement

Directions: Below is a list of operations. Select the operations used in squaring up a board to dimensions and number these operations in the proper order. Place the proper number in the blank space before each operation.

.... File the corners.
.... Saw and square the stock to length.
.... Select and prepare a working face.
.... Plane the stock to the proper width.
.... Round off the corners with sandpaper.
.... Prepare a working edge.
.... Gauge to the proper width.
.... Prepare a working end.
.... Measure and mark to the proper length.
.... Chisel the ends smooth.
.... Plane the other face smooth.

Keys

Part I

1. T	11. T	21. T	31. T	41. F
2. F	12. F	22. F	32. F	42. F
3. F	13. T	23. F	33. T	43. T
4. T	14. T	24. F	34. F	44. F
5. T	15. F	25. T	35. F	45. F
6. F	16. F	26. T	36. F	46. T
7. F	17. F	27. T	37. T	47. T
8. T	18. F	28. F	38. F	48. T
9. T	19. T	29. F	39. F	49. F
10. T	20. T	30. F	40. T	50. F

Part II

1. 1	5. 4	9. 4	13. 1	17. 5
2. 3	6. 1	10. 2	14. 2	18. 4
3. 3	7. 2	11. 3	15. 1	19. 2
4. 3	8. 2	12. 3	16. 5	20. 3

Part III

1. file	11. across
2. rip	12. rusting
3. oilstone	13. wrench
4. board foot	14. finer
5. screw driver	15. surface 2 sides
6. annual ring	16. 144
7. try square	17. 16
8. thousand	18. larger
9. beautify	19. saw cut
10. checks	20. pencil

Part IV

1. lateral adjusting nut	6. rip
2. adjusting nut	7. crosscut
3. lever cap	8. countersink
4. plane-iron cap	9. sliding T bevel
5. knob	10. backsaw

Part V

....	5	4	....
7	....	3	8
1	2	6	

Final Safe-Driving Examination

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The statements listed below are either true or false. Place the letter *T* in front of the statement you think is true, and the letter *F* if you think it is false.

.... 1. Dynamite contains more potential energy than gasoline.
.... 2. The intake manifold distributes the gasoline and air mixture to the valves.
.... 3. The automotive gas engine operates on a 4-stroke cycle.
.... 4. Valves are driven by the camshaft.
.... 5. The camshaft is driven by the crankshaft.
.... 6. The higher the compression ratio the higher the power obtained.
.... 7. The overdrive means that the driver is placed ahead of the engine.
.... 8. With the shifting lever in neutral, engine may run while the automobile remains stationary.
.... 9. Gasoline and alcohol mix.
.... 10. The question of the relative merits of men and women drivers has never been settled positively.
.... 11. Young people have proportionately more accidents than older people.
.... 12. Prepared decisions are useless because they are forgotten.
.... 13. The bored driver is a menace.
.... 14. 30,000 people were killed last year as a result of automobile accidents.
.... 15. The most unimportant part of the automobile is the driver.
.... 16. A traffic circle is fundamentally poor planning.
.... 17. Automobiles play a part in the increase in crime.
.... 18. The effect of carbon monoxide is one of stimulation.
.... 19. Radio sets are dangerous to some drivers.
.... 20. The distributor distributes power to the hydraulic brakes.
.... 21. Automobile engines are usually cooled by water.
.... 22. You may run an automobile without oil for approximately five miles without material harm to the engine.
.... 23. The speed of the automobile is controlled by a device called the carburetor.
.... 24. There are approximately 10 million automobiles in use today.
.... 25. Modern tires are more dependable than early tires.
.... 26. Coasting is bad driving practice because the brakes alone may not be able to stop the car as quickly as necessary.
.... 27. People with "tunnel vision" can see objects coming toward them from the side.
.... 28. Most drivers do not recognize their bad habits.
.... 29. The average driver starts applying the brakes at the exact instant he sees danger ahead.
.... 30. Drunken drivers usually realize they must be very careful.
.... 31. Insects flying into the car should cause the driver to "step on the gas."
.... 32. Drivers who are in a hurry tire themselves.
.... 33. In some states any person, even a lunatic, may legally drive an automobile.
.... 34. The Bureau of Public Roads helps the states to build highways.
.... 35. The best type of pavement is brick.
.... 36. Three-lane highways have proved less dangerous than two-lane highways.
.... 37. Overloading a car is both dangerous to the automobile and to the driver.
.... 38. Street cars are usually passed on the left.
.... 39. Depressing the headlight beam is dangerous when another car is approaching from the opposite direction.
.... 40. Park usually about 2 feet from a fire hydrant.
.... 41. On the average, one person is killed every 15 minutes by an automobile.
.... 42. As the road surface varies, so does the braking distance.
.... 43. The more speed, the greater number of miles to a gallon of gasoline.
.... 44. The faster a car goes, the hotter the air in the tire tubes becomes. This causes contraction and cooling of the tires.
.... 45. Snubbing the brake pedal is useful for going down short hills to avoid excessive brake wear.
.... 46. More than half of the fatal motor accidents occur after sundown.
.... 47. Glare often causes accidents. Put beam of headlights up when driving through fog.
.... 48. Always pull your car over to right lane when making a left turn.
.... 49. Salt solutions make desirable antifreeze mixtures.
.... 50. Knocking occurs when the spark is too far advanced.
.... 51. Mechanical defects of the vehicle contribute to a great proportion of accidents.
.... 52. Most pedestrian fatalities occur while crossing the street in the middle of the block.
.... 53. One out of ten pedestrians killed is a child playing in the street.
.... 54. On the average, one person is injured every 31 seconds.
.... 55. For every person killed by a gunman, six are killed by an automobile.
.... 56. There are really very few real automobile *accidents*.
.... 57. Elementary-school children have had a greater improvement in their accident record than older people.
.... 58. The owner of a car is responsible for damage done by his car only when he is driving.
.... 59. The owner of a car is responsible for damage done by his car only when a licensed driver is using it.
.... 60. Unless he notified or can prove to the police that his car was stolen, an automobile owner is responsible for all damages done by negligent use of his car.
.... 61. For a driver to run away from the scene of an accident is usually regarded as a confession of guilt.
.... 62. A negligent driver must not necessarily be held liable.
.... 63. Contributory negligence occurs when both people involved in an accident are in the wrong.
.... 64. Property-damage insurance insures your car against loss.
.... 65. New York State has a Financial Responsibility Law.
.... 66. When walking along rural highways, always walk to the right of the traffic that is coming toward you.
.... 67. In general, streets should be crossed at a leisurely pace.
.... 68. There is a need for better pedestrian laws and stricter enforcement.
.... 69. Good driving is essentially one of good attitudes, by the motorist.
.... 70. It is not compulsory in this state to have safety glass in a new automobile.
.... 71. Never park on the highway.
.... 72. Braking distance for 40 m.p.h. is approximately 88 ft. plus 51 ft. reaction time.
.... 73. The speed limit in New York State is 45 miles per hour.
.... 74. The smart pedestrian will, if confused, stand still and be calm, rather than dart back and forth in traffic.
.... 75. Revocation of a driver's license usually follows passing a stop sign.
.... 76. Beginners and experienced drivers usually make the same mistakes.
.... 77. Impatient drivers do not constitute a serious traffic menace.
.... 78. Modern cars usually have four speeds ahead.
.... 79. Traffic circles are really speed traps.
.... 80. Safety glass is made with clear rubber binders.
.... 81. Black-on-red highway signs are seen better by the motorist.
.... 82. Oil pressure is registered by the ammeter.
.... 83. Generally speaking, it is safe practice to pass on the right.
.... 84. When going down a steep hill, coast and save gas.
.... 85. It is permissible to pass on curves.
.... 86. 1 per cent carbon monoxide is not fatal.
.... 87. If a person is overcome by carbon monoxide, get him out into the

fresh air, and call a doctor.

.... 88. When you hear a siren, pull over to the right and keep going at your regular speed.

.... 89. 19 years of age is the minimum age limit for operator's license in New York State.

.... 90. More people were killed in 1937 by the automobile than at any other time.

.... 91. The driver on your left has the right of way.

.... 92. Alloy steels are generally weaker than ordinary carbon steel.

.... 93. Lubricate your car at least every 200 miles.

.... 94. Lubricate your car every 5,000 miles.

.... 95. Pistons are fastened to the clutch.

.... 96. Wooden-block roads provide good traction at all times.

.... 97. Deflating tires to low pressure is a good method of providing good traction when driving on ice.

.... 98. Increases in the number of accidents raise insurance rates.

.... 99. It is desirable that all automobiles have automobile insurance.

100. List two ways in which a poor driver may be quickly recognized. *a*)..... *b*).....

101. The three effective points of attack on the safe-driving problem are: *a*)..... *b*) ..... *c*).....

102. List four things to do when an accident occurs, when you are involved. *a*)..... *b*)..... *c*)..... *d*).....

103. Insurance rates on automobiles vary because of: *a*)..... *b*).....

104. List four items you would include in a test for driver's license. *a*)..... *b*)..... *c*)..... *d*).....

105. List three driving errors which cause a car to stall. *a*)..... *b*)..... *c*).....

106. List the four strokes of the four-stroke-cycle engine: *a*)..... *b*)..... *c*)..... *d*).....

107. Describe reaction time. .....

108. The most common causes of automobile fatalities are: *a*)..... *b*).....

109. List four ways of avoiding fatigue on a long trip. *a*)..... *b*)..... *c*)..... *d*).....

110. List two types of traffic circles. *a*)..... *b*).....

111. List two "codes of the road." *a*)..... *b*).....

112. List and explain three recognized hand signals. *a*)..... *b*)..... *c*).....

113. List four safety organizations relating to traffic and automotive regulations.

114. Should a driver offer rides to hitchhikers? Give a reason for your answer. .....

115. What age group is responsible for the greatest number of accidents per thousand of licensed drivers? .....

116. List six common defects that might develop in a motor vehicle. *a*)..... *b*)..... *c*)..... *d*)..... *e*)..... *f*).....

117. List six simple warning signs in common use today. *a*)..... *b*)..... *c*)..... *d*)..... *e*)..... *f*).....

118. List three means of cooling an auto engine. *a*) ..... *b*) ..... *c*).....

119. Describe how to start a car when battery is dead. .....

120. Why does rapid stopping wear out breaks more rapidly than gradual stopping? .....

121. Explain "driving ahead" in driving an automobile. .....

122. How can young drivers improve their driving records? .....

123. What would you do in the following driving emergencies: *a*) Fire apparatus approaches from the rear; *b*) pedestrian hurt by your car?

124. List three devices to keep ice from forming on windshields. *a*)..... *b*) ..... *c*).....

125. List two factors that make an engine difficult to start in cold weather. *a*)..... *b*).....

126. Explain why the engine should not be raced immediately when started. ....

127. A student has been given permission to purchase a used car. List at least five factors he should take into consideration, including safety features. *a*)..... *b*)..... *c*)..... *d*)..... *e*).....

128. List three facts to show how serious the automobile-accident situation really is. *a*)..... *b*)..... *c*).....

129. List at least two items that we can expect to find in our newer and future automobiles. *a*)..... *b*).....

130. List three parking errors with negligence on the part of the driver. *a*)..... *b*)..... *c*).....

Key

1. F	21. T	41. T	61. T	81. F
2. T	22. F	42. T	62. F	82. F
3. T	23. T	43. F	63. T	83. F
4. T	24. F	44. F	64. F	84. F
5. T	25. T	45. T	65. T	85. F
6. T	26. T	46. T	66. T	86. F
7. F	27. F	47. F	67. F	87. T
8. T	28. T	48. F	68. T	88. F
9. F	29. T	49. F	69. T	89. F
10. T	30. F	50. T	70. F	90. T
11. T	31. F	51. F	71. T	91. F
12. F	32. T	52. T	72. T	92. F
13. T	33. T	53. F	73. F	93. F
14. F	34. T	54. T	74. T	94. F
15. F	35. F	55. T	75. F	95. F
16. F	36. F	56. T	76. F	96. F
17. T	37. T	57. T	77. F	97. T
18. F	38. F	58. F	78. F	98. T
19. T	39. F	59. F	79. F	99. T
20. F	40. F	60. T	80. F	

100. Doesn't give effective or correct signals, gunning at the signal light, breaking law, speeding, showing off, improper parking, not courteous to other drivers or to pedestrians, eyes off road, road hog, bragging about his ability.

101. *a*) Engineering; *b*) education; *c*) enforcement.

102. *a*) Notify proper authorities. *b*) Do not become confused. If necessary, take notes, get witnesses. Do not assume liability. *c*) Remain at scene of accident and get wreckage off road, when possible. *d*) Call a doctor or have injured sent to hospital. Give *first aid* if possible.

103. *a*) Locality; *b*) number and severity of accidents, size of claims paid out.

104. *a*) Physical — eyes, manual control and dexterity, color test, deformities. *b*) Mental — I.Q., reading, knowledge of laws relating to automobiles, knowledge of autos. *c*) Retest — after a given length of time, check on physical and mental condition, and ability. *d*) Ability test — starting, stopping, parking, turning around, right- and left-hand turns, turning a corner, night and day driving, practice of laws, starting on a hill, etc.

105. Letting clutch out too fast, car in improper gear, not feeding car enough gas, emergency brake on.

106. *a*) Intake, *b*) compression, *c*) power, *d*) exhaust.

107. The time it takes a person to react to a given need, for instance, to place his foot on the brake pedal.

108. *a*) Driving on wrong side of the road, *b*) speeding.

109. Frequent stopping periods, getting out of car and exercising, getting plenty of sleep, eating sparingly, adjusting seat so driver is not tensed.

110. *a*) Rotary, *b*) cloverleaf.

111. The driver approaching from the right has the right of way, keep to the right, pass to the left, use hand signals before stopping or turning out.

112. Extend left arm out of window and raise it an angle of 45 deg.; left arm extended horizontally; left arm extended, palm of hand open, and facing backward.

113. Automobile Club of America, National Conference of Parents and Teachers, National Safety Council, U. S. Bureau of Standards, U. S. Office of Education, National Conference on Street and Highway Safety, United States Bureau of Public Roads, National Bureau Casualty and Surety Underwriters, Automobile Manufacturers' Association, American Legion.

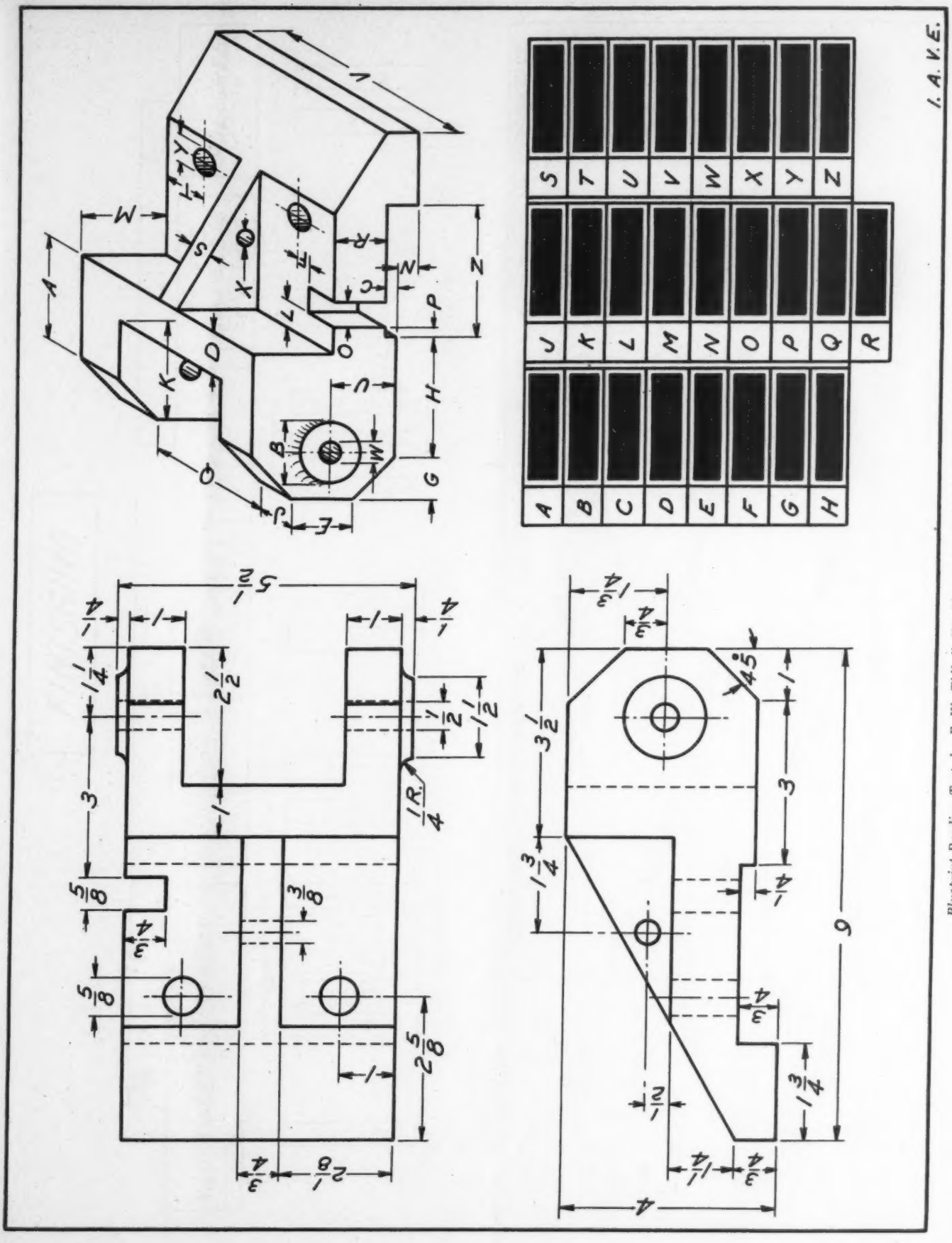
114. No. He is responsible for the safety and well-being of everyone in his car. The hitchhiker might be a thug.

115. Under 20 years of age.

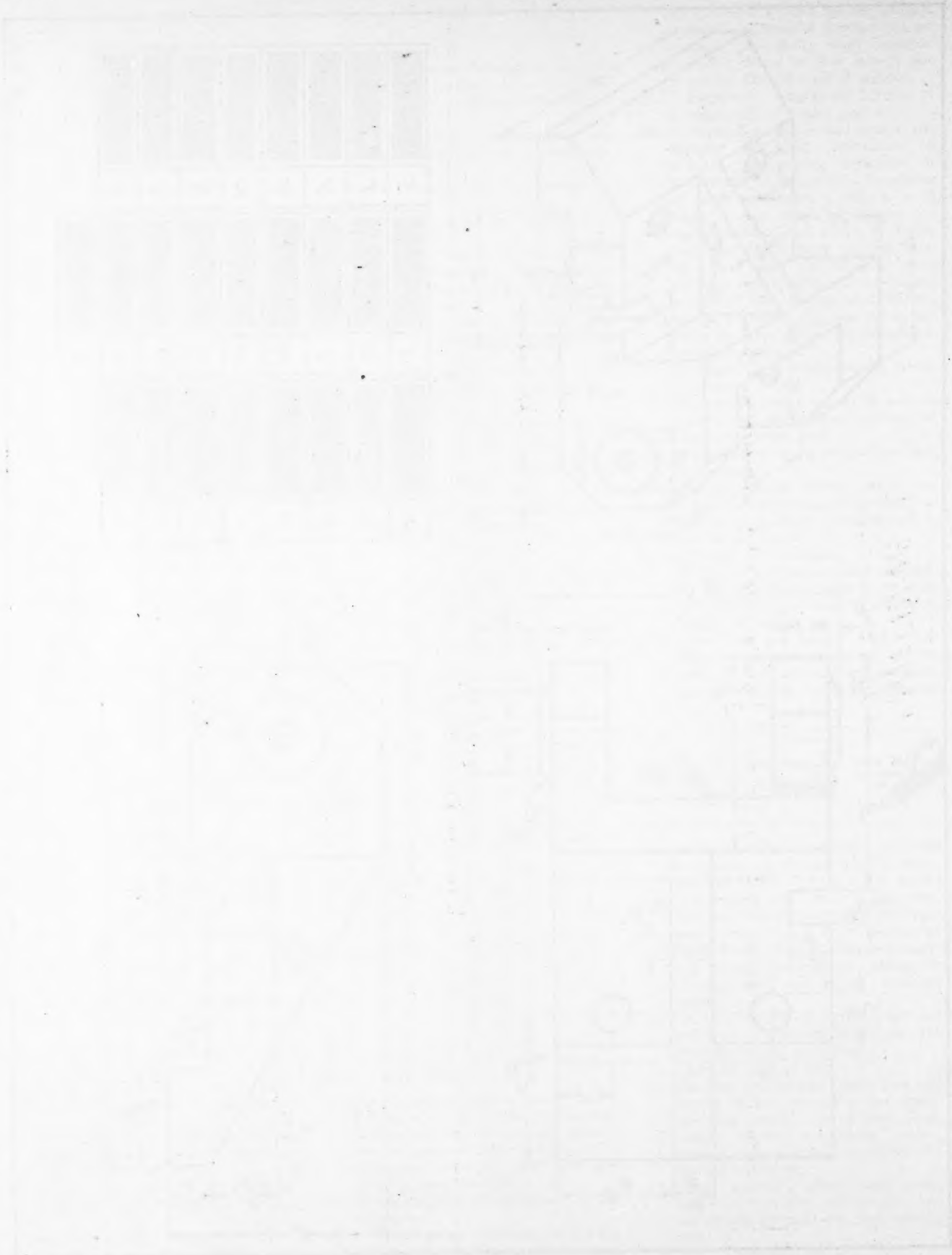
116. Flat tire; ignition short; lights burn out; battery will not turn starter over; engine not firing properly due to spark plugs, points, valves; overheating engine; freezing engine solution; fuse blown out; flooding carburetor.

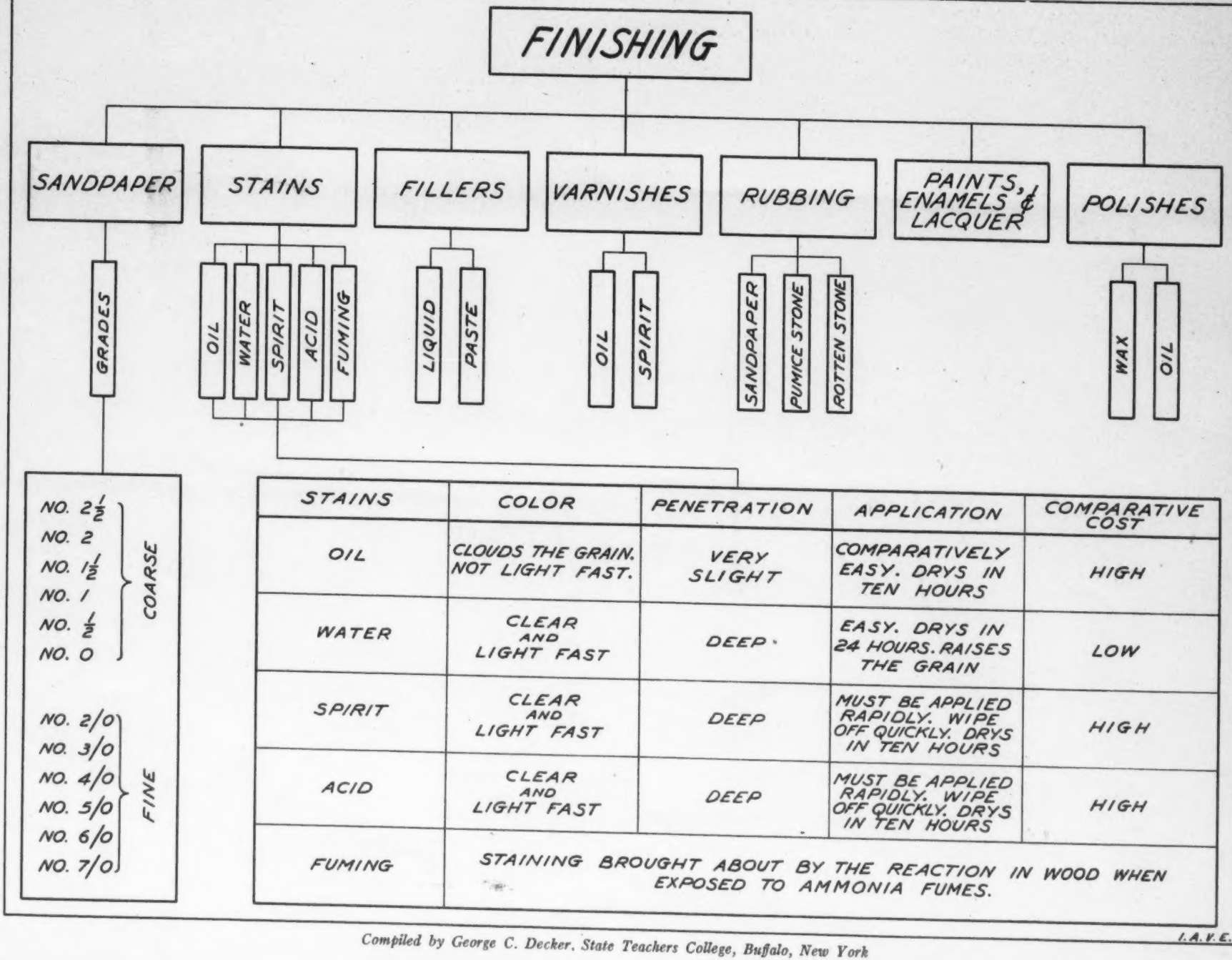
117. Curve, crossroad, school, steep grade, road ends, stop, slow, soft shoulder, narrow bridge, railroad, side road, winding road.

(Continued on page 391)



Blueprint-Reading Test, by E. W. Tidball, Washington Jr. High School, Duluth, Minnesota





STAINS	COLOR	PENETRATION	APPLICATION	COMPARATIVE COST
OIL	CLOUDS THE GRAIN. NOT LIGHT FAST.	VERY SLIGHT	COMPARATIVELY EASY. DRYS IN TEN HOURS	HIGH
WATER	CLEAR AND LIGHT FAST	DEEP	EASY. DRYS IN 24 HOURS. RAISES THE GRAIN	LOW
SPIRIT	CLEAR AND LIGHT FAST	DEEP	MUST BE APPLIED RAPIDLY. WIPE OFF QUICKLY. DRYS IN TEN HOURS	HIGH
ACID	CLEAR AND LIGHT FAST	DEEP	MUST BE APPLIED RAPIDLY. WIPE OFF QUICKLY. DRYS IN TEN HOURS	HIGH
FUMING	STAINING BROUGHT ABOUT BY THE REACTION IN WOOD WHEN EXPOSED TO AMMONIA FUMES.			

I.A.V.E.

Compiled by George C. Decker, State Teachers College, Buffalo, New York

(Continued from page 386)

118. *a*) Air, *b*) water, *c*) oil.
119. *a*) If headed down hill, put car in high gear, turn on ignition, let clutch out when moving. *b*) If on level, get a car to shove you, turning on ignition, put car in high gear and let clutch out. *c*) Crank it.
120. Higher speed means more friction when brakes are applied. More friction means more heat, consequently more wear.
121. Analyzing traffic situations before nearing them, visualizing scenes several hundred feet ahead as they will be when driver reaches them.
122. Obey traffic laws; imitate good drivers; signaling correctly; avoiding discourtesy through the use of horn, weaving, hogging road; avoiding poor drivers by staying away from them.
123. *a*) Pull over to the right and stop. *b*) If necessary, driver should call a doctor, take person injured to hospital, secure names of witnesses, report to police, report accident to insurance company.
124. Solution on windshield wiper, putting small piece of wood under hood near windshield end and locking it down, electric defroster, hot-air defroster.
125. Heavy oil, battery not up to normal.
126. The oil on the cylinder walls is placed there only after the engine is running. When starting, therefore, the pistons really move for a few seconds with very little lubrication. Racing the motor during these few seconds creates wear on all moving parts until the oil reaches them.
127. Visibility — sideposts prevent vision, obstructed; steering — easy, automatic centering after turns, road shock; brakes — tests; tires — how long will they last, retread or new; lights — night visibility; previous owner; cost of operation; depreciation; trade-in value; characteristics of that particular model; motor and rear-end noise; performance test; blue-book price; examine to see if car has been in smashup.
128. Costs 1½ to 2½ billion dollars yearly; 39,000 persons killed in 1937; one out of two persons will be injured in next 50 years; one out of every four persons will be injured in next 25 years.
129. Nonblinding headlights; engine in rear; more visibility; more efficient engines; air conditioning; better brakes; blowout-proof tires.
130. Parking in front of a hydrant, double parking, parking too far from curb, not cramping front wheels over to curb when parking on a hill, parking in front of a driveway.

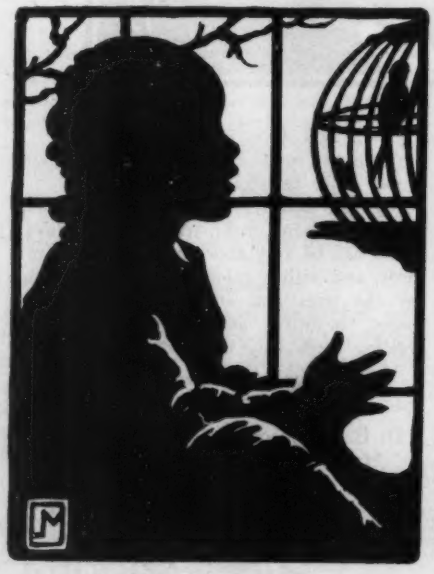
Problems and Projects

BLOCK PRINTING FOR JUNIOR HIGH SCHOOLS

May Lillian Lampe, Weehawken, New Jersey

Block designing and cutting is a fascinating art. It is not an easy one, but once understood, many enjoyable hours can be spent at it. The first and most important step is to decide on the idea that is to be used, for the originality and composition are the fundamentals of a good block. No matter how clever the block cutter may be in cutting or planning a beautiful color scheme, his efforts are largely wasted if the finished block does not present an idea. A camera very often can be of assistance in helping with ideas — for a picture, well taken, of a nature study is real and has great possibilities. Therefore, use this medium of expression if you enjoy photography. Nature is an important source of inspiration for most artists. Trees, flowers, birds, insects, animals, little children at play, all suggest compositions for block designing.

After the idea to be used has been chosen, make a rough sketch of it on paper — the size of the block. There are different types of blocks used in the schools today, (linoleum, Parra, Parazon, and Artcraft composition) all of which lend themselves admirably to accurate cutting and reproduction. Make the design contrasts of large and small areas of black and white. Avoid splitting the section into patterns that are too intricate, as this makes the cutting more difficult. Many otherwise charming blocks have lost their charm because fine details were overstressed. Silhouettes, that is, black against a white background are lovely in block designing and simplify much detail for the amateur. A still simpler method is where a subject is produced by cutting out a white pattern from a background of black.



The cutter must remember as he makes his drawing that it will be reversed when the impression is made. This is not confusing to the average student until he starts to letter or to do portrait work. Then it becomes more difficult. After the drawing is completed in a satisfactory manner, transfer it to the block by means of carbon paper. This will make the design fairly visible. To make it easier for the cutter, the lines should be carefully gone over and strengthened with a pencil. Many students coat the dark surface of the block with opaque white first, as it is easier to work on a white background. Some, too, make pen-and-ink sketches directly on the block. This eliminates the tracing part of it.

The next step is the cutting. At this time, too, the decision must be made whether one

or more colors are to be used. In most classrooms, presses are not available for printing in several colors. A one-color plan, therefore, is the only one that can be used under such conditions. Then, too, the one-color block is the easiest to cut for the beginner. After the impression is made, a tinting later with opaque water colors put on by hand may be used under such conditions and will provide an individual way to work out a simple block design.

For the cutting of an average block, four tools — a knife, a whetstone for sharpening the tools, a gouge, and a veiner are all that is needed. The gouge is used for lifting out large areas and broad spaces, the veiner for the fine work. To get acquainted with and understand these tools is the first step toward good block cutting. One can often practice on a small piece of material to gain proficiency. The whetstone is a necessity, for dull tools will not do good work.

In cutting the block, hold the tool firmly. Gouges are held in the palm of the hand, a bit below the center, with the first finger nearest the cutting point. The gouge is pushed away from the student. Curved lines are cut by turning the block with the left hand. The cutter must remember that every bit that is cut away or lifted out will appear white on the finished impression. In cutting with the knife, the blade is drawn toward the student as far as possible and away from the design. In cutting a line, follow it as closely as possible holding the knife at an angle so as to form a broad base for it on the block. The second cut must now be made close enough to the first one so that the two cuts intersect beneath the surface of the block. This makes it possible to lift out V-shaped strips of material. Each line or surface must be outlined in this manner. Large surfaces, of course, are removed with the gouge.

After the cutting has been finished, ink it with a printer's roller. Lay a sheet of paper upon the inked block and take an impression, using a proof planer and mallet.

If a printing press is available, many interesting color combinations can be worked out.

In making more than one block, for a color print, follow this procedure. After the tracing is entirely completed, outline the design with a fine veining tool. The veined block is the key block which must be duplicated on all the other blocks needed to produce the required colors. Each color will need a separate block, unless an overlapping of colors is planned.

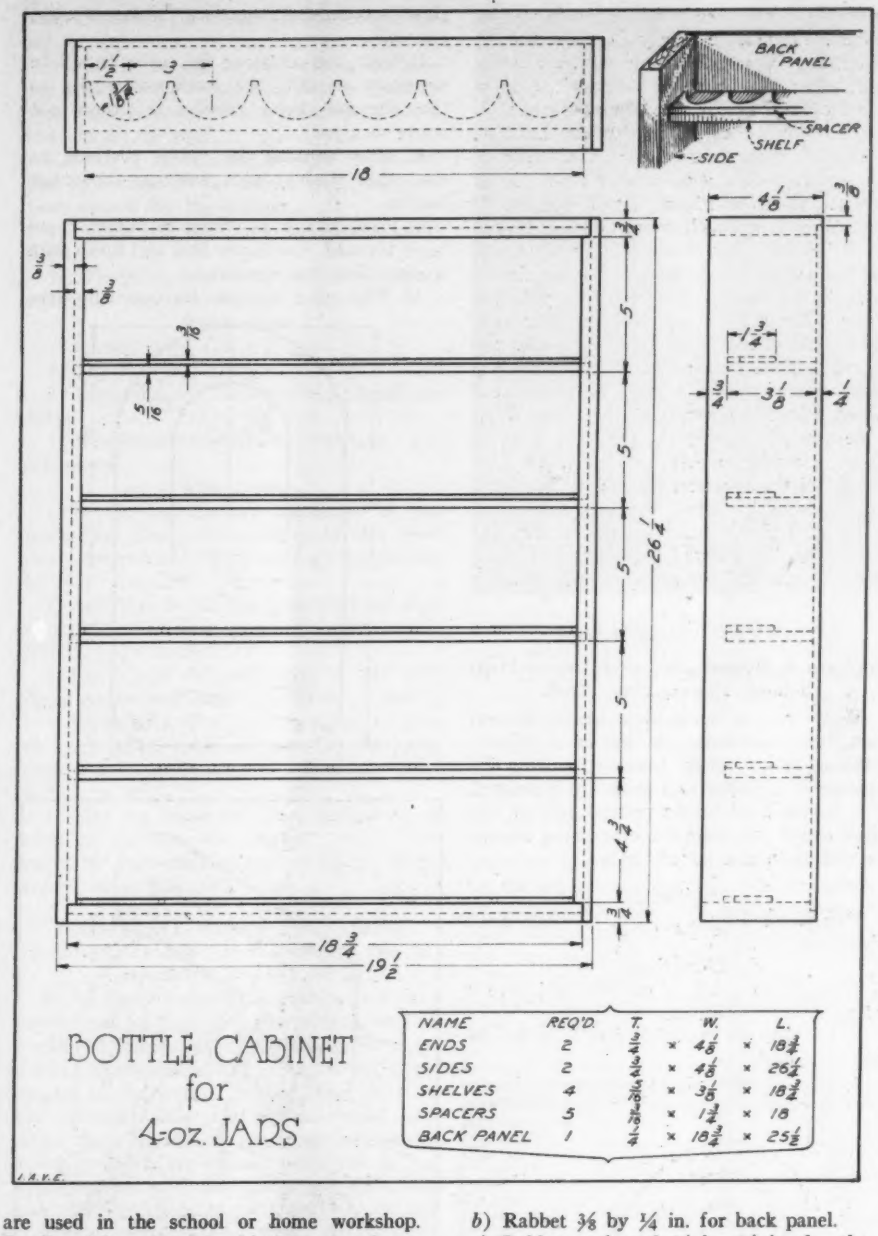
Overlapping colors is fascinating. To make a blue, yellow, and green color scheme, for instance, only two blocks, one for the blue and one for the yellow will be necessary, as the third color, green, is produced by overlapping. This type of work, of course, is intricate and needs a press in order to secure proper color registration.

With the holiday season approaching, snapshots of balsam or fir trees may be taken. These will be very appropriate for Christmas cards, and with a color plan of a green-blue for the trees and an orange-yellow for a sunset, beautiful and strikingly attractive greeting cards may be produced.

BOTTLE CABINET FOR THE WORKSHOP

D. E. Ferguson and Thomas Jungck,
Horace Mann Jr. High School,
West Allis, Wisconsin

This cabinet was designed to hold glass jars used for storing nails, screws, bolts, fasteners, hinges, repair parts, and other articles that



NAME	REQ'D.	T.	W.	L.
ENDS	2	3/4	4 1/8	18 3/4
SIDES	2	3/4	4 1/8	26 1/4
SHELVES	4	7/16	3 1/8	18 3/4
SPACERS	5	7/16	1 3/4	18
BACK PANEL	1	1/4	18 3/4	25 1/2

are used in the school or home workshop. Small articles, stored in this way, are always in full view of the worker and are, therefore, readily found. The spacers are an important part of the cabinet as they keep the jars uniformly spaced and also prevent them from sliding or tipping off the shelves. As the jars are always evenly spaced, they may be easily removed from the cabinet when needed.

Procedure

The frame and spacers of this cabinet may be made of any kind of wood that the worker has available. The back panel is of ¼-in. plywood. The shelves should be made of a hard wood as they will be subjected to considerable strain.

Ends:

a) Cut stock to size for ends.

b) Rabbet end pieces ⅜ by ¼ in. for back panel.

Sides:

a) Cut stock to size for sides.

b) Rabbet ⅜ by ¼ in. for back panel.

c) Rabbet each end ¾ by ⅜ in. for the corner joints.

d) Mortise ⅜ in. deep and 5/16 in. wide for shelves.

Shelves:

a) Cut stock to size for shelves.

Spacers:

a) Rough stock to size.

b) Lay out half circles according to detail.

c) Nail the five spacers together with brads and cut out with jig or coping saw.

Back Panel:

a) Cut plywood to size for back panel.

Assembly:

a) Fasten sides to ends with 1¼ in., No. 8 f.h.b. wood screws.

b) Nail spacers to shelves.

c) Insert shelves in the mortises.

d) Nail back panel in place with brads.

This cabinet is designed to hold 30, 8-ounce jars of the type that cheese and salad dressings are usually put up in. The dimensions in this drawing may be easily altered so a cabinet may be constructed to hold a different number or size of jars.

In the designing of this cabinet, space was left in front of the shelves so a door may be fitted if it is desirable to lock the cabinet.

MECHANICAL-DRAWING BINDERS

Guy A. Pratt, Washington High School, East Chicago, Indiana

Drafting teachers and students who are confronted with the task of taking care of finished drawings may find in the following described loose-leaf binders a partial solution to their problem. Not only do these binders protect the drawings from becoming soiled, wrinkled, and torn, but, they also may encourage those students who destroy their plates as soon as they have received their grades, to retain their drawings and take more pride in their work.

These binders are easily made, and no previous experience in bookmaking is necessary. They can be constructed directly in the drafting room. The only tools necessary for the job consist of a manual-training or sloyd knife, a bone folder, and a hand drill with a 5/32-in. drill. A paste brush will, of course, be used to spread the paste.

As to the consumable materials, the following is required: Heavy bindery board 3/16 in. in thickness, imitation leather, a can of good quality library paste, some heavy-weight wrapping paper, and some screw posts. The school librarian will likely be able to give information as to where these items may be procured.

The accompanying illustrations show the binder as being made especially for 12 by 18-in. drawings, but, of course, they may be made to fit any desired size of paper used for the drawings. Practically the only changes that must be made are in the length and width of the bindery boards, the balance of the work remaining as illustrated for all sizes.

If there is a printshop in the school, the boards may be cut there; if not, they can be cut with a knife and a straightedge..

Method of Procedure

Cut the boards so as to allow ¼ in. to extend beyond the edges of the paper except at the back, or binding edge. Thus, for paper 12 by 18 in., the over-all size of the boards should be 12½ by 18¼ in. Only the top cover is hinged. Cut a strip ⅞ in. wide from one end of the board that is to be used for

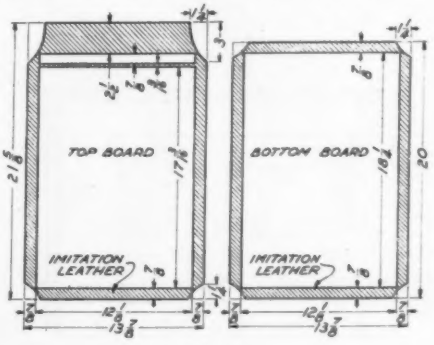


Fig. 1

the top, and save it for the binding strip. Cut off another strip 3/16 in. wide and throw it away. The 3/16-in. space allows for the grooved hinge which is necessary to permit the board to bend back. (See Fig. 1.)

The imitation leather is next cut to size, allowing ⅞ in. for the turn-in all around except at the binding edge of the top cover. Here 1½ in. must be allowed so that the material can be drawn over the hinge groove and pasted down on the main board to give additional strength to the hinge. Now, spread paste evenly over one side of each board and lay them down on the imitation leather. Turn the leather side up and rub it well with a clean cloth to insure adhesion at all points. Paste the binding strip down in its proper position, being sure to allow the 3/16-in. space for the hinge. Cut away the corners to within 5/16 in. of the corner of the board. Coat the edges of the imitation leather all around with paste, then turn them over, the long edges first. (See Fig. 2.) Pull the material over tightly with the finger tips as in Figure 3. After turning in the long edges, small triangular ears will be noted, at the corners. Push these neatly in with a bone folder, as shown in Figure 4, and turn in the short edges. Push the imitation leather down into the hinge groove, then rub the edges all around with the folder so that the material is sure to stick securely. Line the inside of the boards with a good quality of wrapping paper as shown in Figure 2, and then weight the covers down with some drawing boards until the paste has thoroughly dried. Afterwards the screw-post holes may be drilled through the binding edges in the positions desired, but they should be accurately centered widthwise of the binding strip. Do not use screw posts that are longer than necessary to accommodate the number of plates contained within the covers at the time. When more space is needed to take care of additional drawings, longer posts can be procured and the shorter ones sold to beginning students.

Figure 5 shows the completed cover. The title may be lettered with ink on good quality paper and pasted on to the top cover as shown.

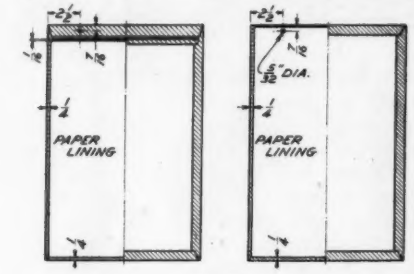


Fig. 2

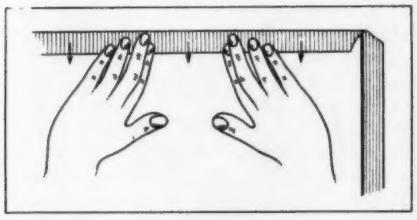


Fig. 3

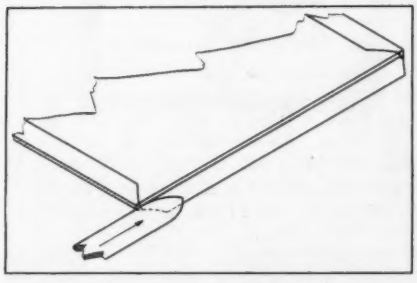


Fig. 4

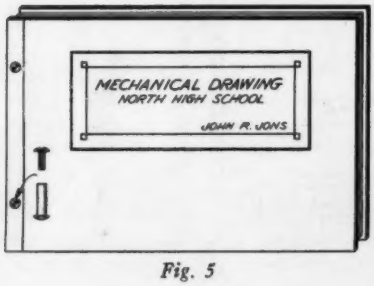


Fig. 5

METAL BOOK ENDS

William J. Becker, Boynton Junior High School, Ithaca, New York

Made from a single piece of black sheet iron, this enameled book end is a welcome addition to any desk. Due to its large flat bottom, its stability as a book end is assured. The turned bead in the vertical part of this book end is put there for ornamental reasons as well as to give added rigidity.

Material

Two pieces 5 by 9 in., No. 22 gauge black sheet iron.

Directions

1. Make out a bill of material and have it approved by the instructor.
2. Get out the materials called for on the bill of material.
3. Lay out both pieces as shown in Figure

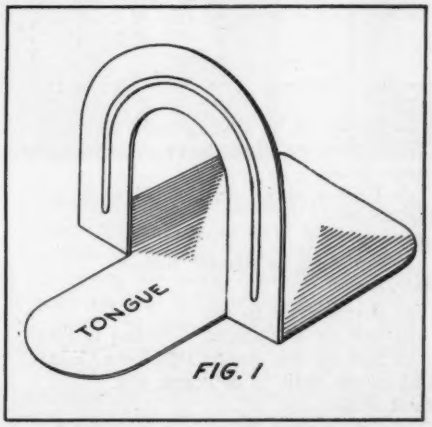


FIG. 1

2. Draw the lines in the following order: Center lines *A* and *B*, curves *C*, *D*, and *E*, and lines *F*.
4. Cut out the blank.
5. File edges smooth. In filing, be sure to keep the part filed close to vise jaws.
6. Next cut out the inside tongue shown in Figure 1. To do this, clamp the blank in the vise as shown in Figure 3. Using a cold chisel and hammer, cut along the first straight line *only*.
7. Next, cut out along the curve. It will be necessary to shift the work continually so that the spot being chiseled is always just above vise jaws.
8. After finishing the curve, continue on the other straight line, finishing the entire tongue.
9. Place in vise as shown in Figure 4 and bend forward. Use hands first and finish with mallet. Test for squareness.
10. File edges smooth. Be especially sure

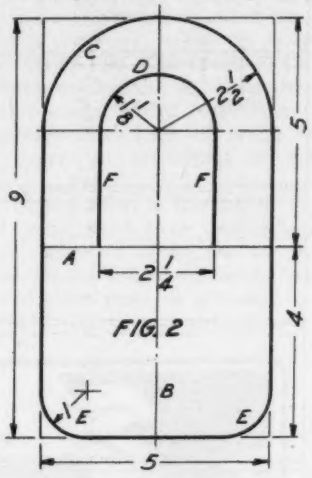


FIG. 2

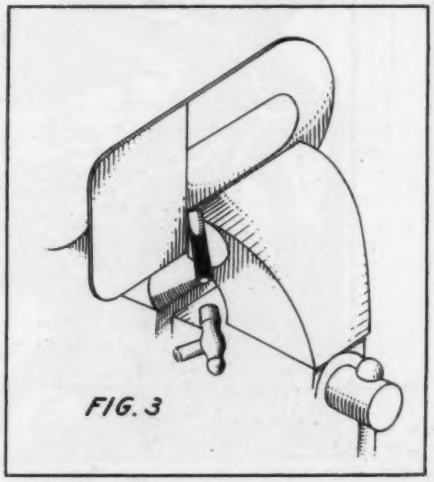


FIG. 3

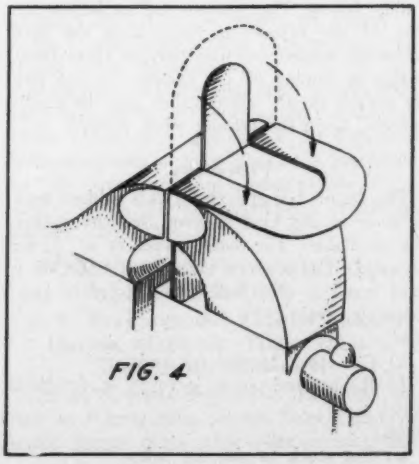


FIG. 4

that the inner curve has all the bumps filed off.

11. With the aid of the turning or beading rolls, roll the ornament shown in Figure 1. Ask the instructor for a demonstration in the use of the rolls.

12. Use a mallet and hammer to smooth out any snarls in the metal, that may have been caused by the rolling.

13. Clean off the book ends with emery cloth.

14. Finish as desired. A coat of dull black enamel is recommended.

References

1. Stanley Tool Chart C53.
2. Any Standary Dictionary.
3. *Essentials of Metalworking*, Berg and Wing.
4. *Metalwork Essentials*, Tustison and Kranzusch.

Questions

1. In the introductory paragraph of this instruction sheet, the stability of this book end is mentioned. What do you understand by this? Ref. 2.
2. Just how do the flat chisel and the cape chisel differ as far as usage is concerned? Ref. 3, p. 34, or Ref. 1.
3. List three different ways a flat cold chisel can be used. Ref. 4, pp. 81–84 or Ref. 1.
4. What kind of a file (in regard to kind of cut) would you use for the following metals: soft steel, hard steel, aluminum, lead? Ref. 4, p. 90.
5. Give the route and final destination of most of the iron ore shipped from Duluth and other iron shipping centers on the Great Lakes? Ref. 4, p. 167.

PRINTING WORD PICTURES

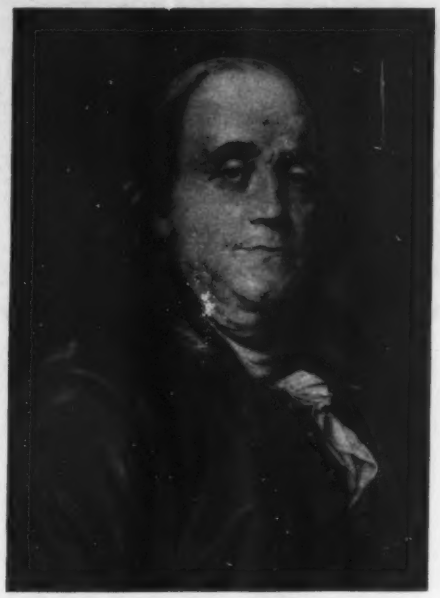
David M. Teichler, Public School No. 61, Brooklyn, New York

While many high-sounding objectives may be claimed for this printshop project, such as facility in handling type, appreciation of letter forms, understanding of picture tones, significance of characters "painted," and the like, the principal claim which these "word pictures" have on the student's interest is their novelty. Pupils are usually interested in the typographical work offered but as a spice, this sort of trick typography is highly stimulating.

Events such as Flag Day, Arbor Day, Labor Day, Thanksgiving, Christmas, and the birthdays of famous Americans, present opportunities for indulging in this painting of "word pictures." Whatever the student's extra-curricular interest, be it baseball, football, or swimming, also may be capitalized as subjects for pictures of this kind.

A photograph, drawing, or halftone print is the starting point for the actual composition of the picture. The original should have sharp contrasts to give best results. Dimensions should not exceed the normal width of average jobs, certainly not above 30 picas. The depth depends largely upon the amount of type available. Type which gives a heavy gray effect is to be preferred; we use 8-point Century Schoolbook but any other type faces may be utilized. The smaller the type size, the shorter is the distance for visibility, i.e., five feet for 8 point, two feet for 6 point.

The depth of the composing stick requires the division of the original picture into an



number of sections, preferably from six to eight picas each. This necessary mutilation of the original suggests the advantage of having at least one extra copy for comparison with the final "word picture."

Having cut the original into sections, set the stick to measure. Place the first section of the picture flat in the bottom of the stick so that there is no play, and run quads up to the first line or shadow of the subject. Then set the type (which may be a speech, an article, or the biography of the subject) in such fashion that the dark portions are filled in with type as solidly as possible, and the light portions blanked out with quads. All thin outlines should be represented by at least one character. Curves around eyes, ears, nose, and chin, may call for the use of parentheses of various sizes, and rules or ornaments to enhance the pictorial effect. Much freedom in the use of any shop material should be permitted the student.

After each line is set and justified, a lead or composing rule is placed between it and the following line. After this next line has been set, the rule is removed, as the finished job is set solid. The proof of each section should be taken as soon as the section is completed and errors corrected before removal of the section from the stick. Finally, make up the complete "word picture" of all the sections in rotation. Adjustments are now made to get angles and curves into smooth fitting lines, adding a rule here, or an ornament there. The final proof should be compared with the original for effects.

Be courteous to all, but intimate with few and let those few be well trie
d before you give them your confidence. True friendshi
p is a plant of slow gro wth, and must undergo
and withstand the shocks of adversity
before it is ent itled to the appell
ation. ❡ The very idea of the
power and the right of th
e People to establish Go
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The pres ation
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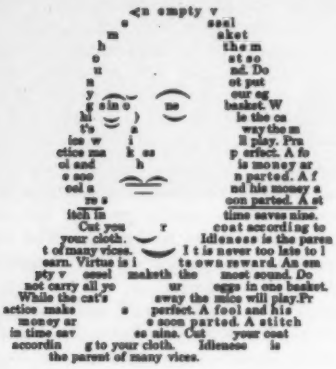
sa deeply, perhaps ally
staked, on the expe entruste
d to the hands of the pl e. ❡ I ho
pe I shall always posse ss fi nness and v
irtue enough to maintain wha t I consider
the most enviable of all titles, the character
of an "Honest Man." ❡ A clen der acquaint
ance with the world must con vince every m
en, that actions, not words, are th e true criterio
n of the attachment of friends; and th at the most lib
eral professions of good-will are very far fr om being the sure
st marks of it. ❡ Associate yourself with men of good quality if you es
teem your own reputation; for 'tis better to be alone than in bad compa
ny. Why forego the advantages of so peculiar a s ituation? Why qu
it our own to stand upon foreign ground? W hy, by interweaving
our destiny with that of any part of Europe, entan
gle our peace and prosperity in the toils of Europea
n ambition, rivalship, interes t, humor or caprice? ❡
A great and lasting war can never be supported on
this principle (patriotism) alo na. It must be aided by
a prospect of interest, or some reward. ❡ Influence is
not government. ❡ The result justifies the deed. ❡ Put none but Ameri
cans on guard tonight. ❡ It is well. I die hard, but am not afraid to go.

GEORGE WASHINGTON

Made up of excerpts from his many speeches and writings.

Born February 22, 1732

BENJAMIN FRANKLIN


An empty v
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ll play. Pra
p erfect. A fo
is money ar
n parted. A f
nd his money a
con parted. A st
time saves nine.
Cut you coat according to
your cloth. Idleness is the paren
t of many vices. It is never too late to l
earn. Virtue is i ts own reward. An em
pty v esse l maketh the most sound. Do
not carry all yo ur eggs in one basket.
While the cat's away the mice will play.Pr
actice make perfect. A fool and his
money ar o soon parted. A stitch
in time sav es nine. Cut your coat
accordin g to your cloth. Idleness is
the parent of many vices.

The Patron Saint of Printing

Born January 17th, 1706

at Boston, Massachusetts

Fourscore and
seven years ago our
fathers brought forth
upon this continent a new
nation , conceived in liberty and
dedicate d to the proposition
that al l men
are c reat
ed eq ual
. Now we a
re en gaged
in a g reat
civil war
t es ting whe ther th at n
a ti on, or a ny nation
s eco nc e iv e d s
o ded ic ate
d caul o ng e
n dure. W o a
r e meto n a gr re a
t battle f ieldoft h at w
ar. We h a ve c
come to ded
icate a port
ion of that
field as a final
resting place for those w
ho here gave their lives
that that nation might
l ive . It is altogether
fit ting and proper t
hat we should do t
his. But in a larg er
sense we cannot dedic ate,
we cannot consecrate, we cannot hallo w th
is ground. The brave men, living and dead, who stru
ggled here have consecrated it far above ou r poor powe
r to add or detract. The w orld will little note nor long r
emember what we say he re, but it ca n never forget what
they did here. It is for us, the liv ing, rather to be dedic
ated here to the great ta sk remaining before us,
that from these honored ded d we take increased dev
otion to that cause for w hich they gave the last
full measure of devotion; that we here highly resolv
e that these dead shall not ha ve died in vain; that t
his nation, under God, shall hav e a new birth of freedo
m, and that government of the pe ople, by the people and
for the people shall not perish fro m the earth.

ABRAHAM LINCOLN

Born in Kentucky February 12, 1809

Died April 15, 1865

The picture necessarily faces in reverse of the original. This should be taken into consideration on certain jobs.

After the final proof has been found satisfactory, set the display lines and make up the form. Extra impression on the solid area is necessary, of course.

The accompanying examples illustrate two types of treatment. The Franklin and Lincoln pictures are done in relief, i.e., the type characters produce the picture and the quads the background. The Washington picture is done in reverse, i.e., the quads produce the face and the type serves as background. The original Franklin copy is shown for comparison with the "word picture."

A great deal of pride and satisfaction on the part of the student follows the effective completion of such a picture and that, to the teacher, leaves little more to be desired. The author would like to receive word pictures inspired by this article to add to his collection.

ETRUSCAN DESIGN CANDLESTICK

Leon H. Baxter, Association for Crippled and Disabled, Cleveland, Ohio

(Continued from page 346, October issue)

This is a very graceful little candlestick and quite simple to make.

The saucer or pan is first made, using a piece of 18-gauge copper cut in rectangular form, 3⅞ in. wide and 9 in. long. Cut a piece of paper to this size and draw a line through its center horizontally. Fold the paper on this center line and divide it into 9/16-in. spaces as shown in Plate 3. Draw vertical lines through these points at right angles to the center line. At the left hand end draw a circle with a compass, having a 3/16-in. radius. On the next line measure up ¼ in. and make a dot. On the next line 5/16 in., on the next 7/16 in., and so on as shown. Connect these points with a graceful and uniform free-hand curve. Cut through the folded paper, along this curve, with shears. If the paper is now unfolded, a balanced outline of the pan of the candlestick is obtained. This must be transferred to the copper. Cut out the shape and file the edges evenly. Then planish all over.

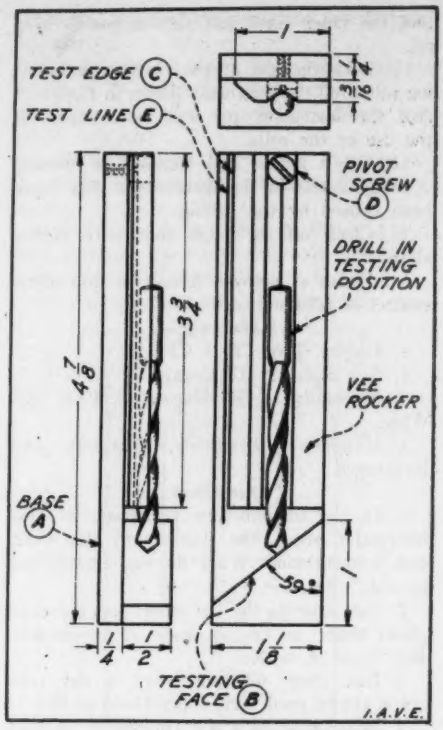
Soften by annealing and bend the front end over a ½-in. pipe. Bend the opposite end over a slightly larger pipe so that the handle outline is similar to that shown on Plate 3. The exposed part of the underside of the curve must also be planished to give a uniform appearance.

Hammer the side edges on a piece of lead to obtain the rolling curves of the sides, taking care that both sides are alike. The outer sides of these cur.es must likewise be planished.

Form the upright holder by either of the two methods given in the first candlestick design and planish all over. The drip pan is a 1⅝-in. circle, hammered on the lead block so that the edges flare up ¼ in. Cut out the hole and fit to the top of the upright B.

Solder A to B and both to the central point of the saucer.

Clean all over with fine steel wool and complete as described under "Finishing," page 306, September issue.



Drill gauge which magnifies grinding errors

DRILL GAUGE MAGNIFIES ERROR

H. Moore, Leeds, England

The writer recently noticed an interesting gauge for testing the cutting angle of small twist drills. It is being used to check the grinding of drills done by apprentices and to show them clearly when they are wrong. It is well known that the cutting angle on the smaller sizes of drills is just as important as on the larger ones but it is difficult to test the former with all the ordinary gauges as

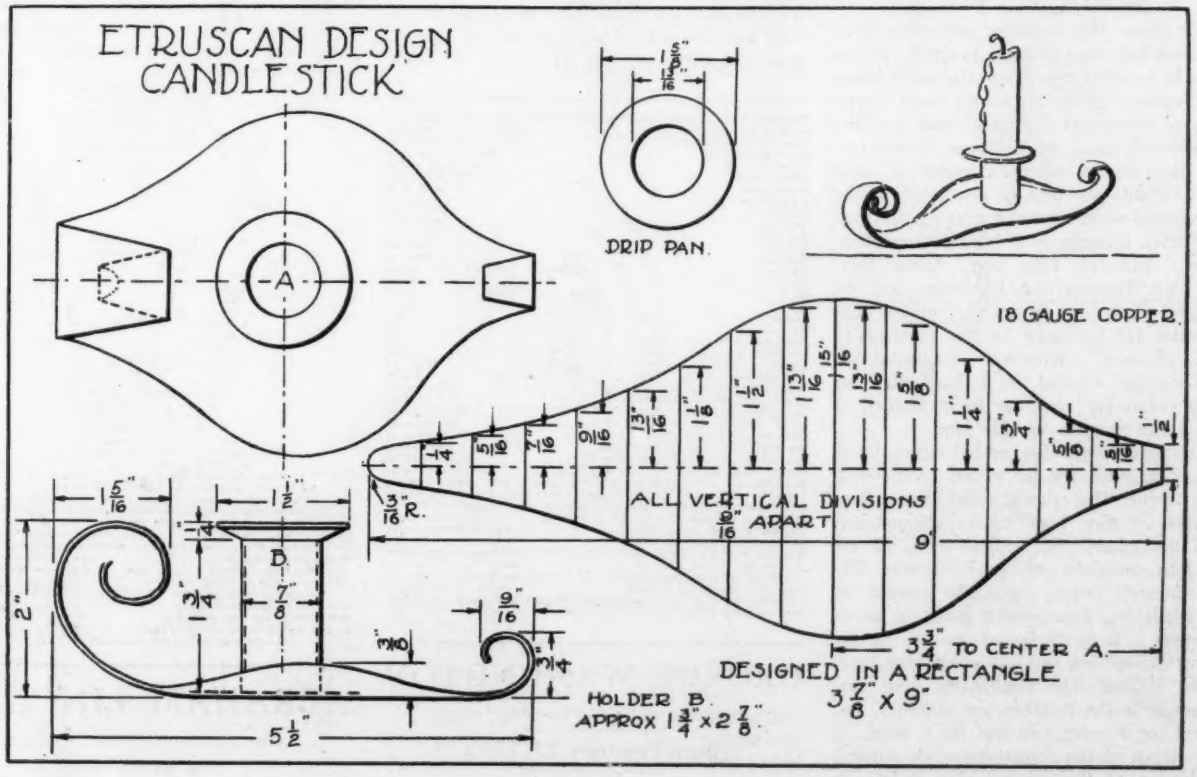


Plate 3

the length of the cutting edge is too short. This gauge lengthens this distance so much that the slightest error can be seen at a glance.

To make the gauge, a base *A* is first of all machined up to leave the angular testing face *B*. Next a rocker vee is made with a vee cut in it and one side beveled down to form a test edge *C*. The rocker is pivoted to the base of flat lead screw *D* so that it swings back and forth easily. Last a test line *E* is scribed on *A* parallel to the edge of *C*.

To use the gauge the drill is held in the vee by the users' thumb, with one side of the cutting face touching *B*. This is done by sliding the drill down with a side motion of the thumb until it stops on face *B*. It should be explained that with this gauge the cutting angle is flat against face *B*. No matter how inaccurate it may be as regards angle, it is the line *E* and edge *C* that shows the error.

Small drills that seem to be good enough when tested with the ordinary gauge are seen to be very much out when tested this way and while it is not necessary, perhaps, to be absolutely accurate with the grinding it is good training to be shown an error if it exists.

SUGAR BOWLS AND CREAMERS

H. M. Dexter, Central High School, Grand Rapids, Michigan

The sugar bowl and cream pitcher described in this article are not much more difficult to make than those described last month.

The sugar bowl and creamer shown in Figure 1 are both started as cylinders 3½ in. in diameter and 3 in. high. The seams are brazed lap joints, as described in last month's article. When the seams are finished properly, both ends of the cylinders are leveled by trimming and filing. Be sure that the cylinders stand vertically when placed on either end. Then proceed with the shaping. Draw a line 1½ in. from the base as shown in Figure 2. This line should be drawn both on the inside and on the outside of the cylinder.

Next, place the cylinder on its side, on the end of a wood block and with a round-end

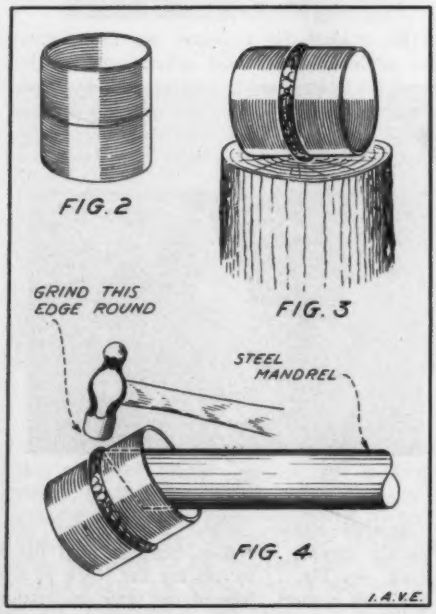


Fig. 1

raising hammer, proceed to bulge out the center as shown in Figure 2, placing the hammer blows along the lines previously drawn. Then begin the more complicated but more interesting work of *drawing in.* This process is slow and laborious, but it is one of the best methods for doing this shaping by hand. Fasten into a machinist's vise a piece of round iron (round mandrel). One end of this, if possible, should be cut on the slant, as shown in Figure 4.

Slip the cylinder over this mandrel, and then, using a 6- or 8-oz. ball-peen hammer from which the sharp edge has been ground, work down a section about ⅜ in. wide until the hammered section touches the mandrel on which it rests. See Figure 4. For this work, it is best to strike many light rather than fewer heavy blows. Remember also that the cylinder must be turned continually as the blows are struck. When the bulge on one end has been flattened out, turn the cylinder and treat the other end in the same way. Then continue, proceeding to hammer gradually toward both ends. Do not forget to anneal the job frequently. Naturally, during the drawing-in process, the job will have the appearance of a badly wrinkled and dented piece of metal, but with care and a little effort, the job can soon be turned into a smooth and pleasing shape. During the course of drawing-in, the edges become a little wrinkled and uneven. These should be trued up several times through the process. There will always be enough metal for trimming, because in the drawing-in of metals, they stretch and if not trimmed the articles thus made would prove to contain too much metal. This trimming and smoothing of the edges is best done just before each annealing.

When trimming the edges of the creamer, remember that it must have a lip, and that, therefore, a suitable amount of metal must be left for that purpose. After the metal has been shaped so that the metal touches the mandrel along the entire length from center to end of cylinder, a small-size bowl hammering stake must be used to arrive at the final shape.

When both cylinders are completely planished, their edges finished level and smooth, and the lip on the pitcher shaped, form collars about ⅛ in. high, on each end. With these collars formed, the diameter at the tops of the cylinders should be approximately 2¾ in. and at the bottoms about 2¼ in. Next, cut and fit the bottoms as described in last month's issue.

The cover for the sugar bowl is just a plain cover with a small collar fitting loosely over the collar on the sugar bowl. The finial is filed to the desired shape from a solid round piece of copper. Then a small hole is drilled through both finial and cover, and a heavy piece of copper wire is pushed through these holes after which both ends of the wire are riveted over. Both the pitcher and the sugar bowl are then to be tinned on the insides only. (See page 298, September, 1937, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.) Then the outside surfaces are polished, after which the handles are made and riveted in place. The rivet heads also must be tinned on the inside after which the bottoms are soldered in, as was done in the sugar bowl and creamer described in the previous article. As a final finish, all parts are polished and lacquered. Lacquering should never be done in a place where the air is damp.

The tinned insides will have a better appearance if finished up with fine steel wool. The insides, of course, are not to be lacquered.

SIGNAL SYSTEM FOR GIRLS' BASKETBALL

H. G. Louthan, Vernon Township High School, Renwick, Iowa

In girls' basketball, as usually played, the referee and players must be notified after each basket as to which side is to have the toss from the center circle. Frequently the card which is generally used as the signaling device, is missing when the game is ready to start. At best, the card is difficult to read from far portions of the court and often causes confusion. In an effort to remedy this situation, the lighting system shown in Figure 1, was introduced at our high school.

At one end of the scorers' table is a red light, while at the opposite end is a green one. These lights are ordinary truck clearance lamps. As shown in the picture, two toggle switches control these lights. One is a single-pole switch and serves to connect the series with the electrical circuit of the building, while the other is a three-way switch and

Fig. 1

controls the alternate lighting of the red and green lamps. This, in turn, gives the desired signal to referee and players as to which team is entitled to the toss. A transformer is built into the assembly and reduces the 110-volt current to the six volts required for operating the clearance lamps.

An additional feature of the scoring table is the use of an automobile horn to designate expiration of playing time at the end of each quarter. This horn is actuated by a six-volt dry "hot-shot" battery and controlled by a bell button on top of the scorers' table. The entire project, including the scorers' table, was constructed by the students in the industrial-arts shop of the school.

A PILOT LIGHT FOR THE GLUE POT

Ivan L. Hill, Grove City College, Grove City, Pennsylvania

The shop teacher frequently finds that the students forget to turn off the glue pot before they leave the woodworking shop. Again, students thinking the glue pot has been turned on, prepare for gluing work, only to find that the glue is not ready when it is needed. Occurrences of this kind can be avoided by placing a small pilot light into the circuit so that a light is showing whenever the glue is heating. The light should be located high above all visual obstructions so that everyone in the shop can see it.

It takes but little material for this project. The largest item is the time required to wire up the system. A suitable length of three-wire No. 16 twisted-strand cord to replace the present cord, a three-pole plug and base, some insulated No. 18 light cord to connect to the pilot light socket, a light socket, and a 7½-watt, 110-volt bulb are needed for the system.

Remove the switch on the glue pot and install the wiring according to the diagram, shown in Figure 1, with the broken lines representing the new circuit that is added for the pilot light.

The two-wire cord on the glue pot is replaced by the three-wire cord. Be careful to keep the two wires A' and B' on the two poles a and d connected to the switch as they were originally. The third wire C' of the lamp

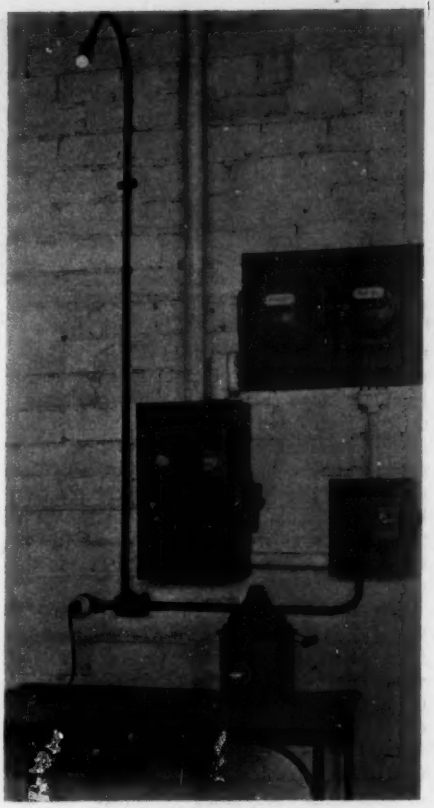


Fig. 2. Pilot light installed on the glue-pot circuit

circuit is connected to post b of the switch. The three wires A', B', and C' are connected to the three-pole plug with the wire C' to be pole x of the plug. The wires A' and B' are connected to the other poles of the plug, y and z respectively. This completes the wiring on the glue pot, therefore the switch may be replaced on the glue pot.

Next, install the lamp wiring. The wire B'' is connected to the power wire B and to one pole on the light socket E which holds the pilot light. The wire C' is connected to the remaining pole of the light socket. The loose end of the wire C' is connected to the pole x' of the plug base. Wires A' and B' are connected to the poles y' and z' respectively of the plug base.

When all these connections are properly made, the lamp will light when the switch is on either of the three heats. If the lamp fails to light, reverse the wires A' and B' on the poles y' and z' of the plug base to eliminate errors in making the connections.

Figure 2 shows the pilot light installed in the shop. Some of the equipment is a little more elaborate than absolutely necessary for the project. However, care must be taken to make the installation meet the Underwriter's specifications and the wiring requirements of your community.

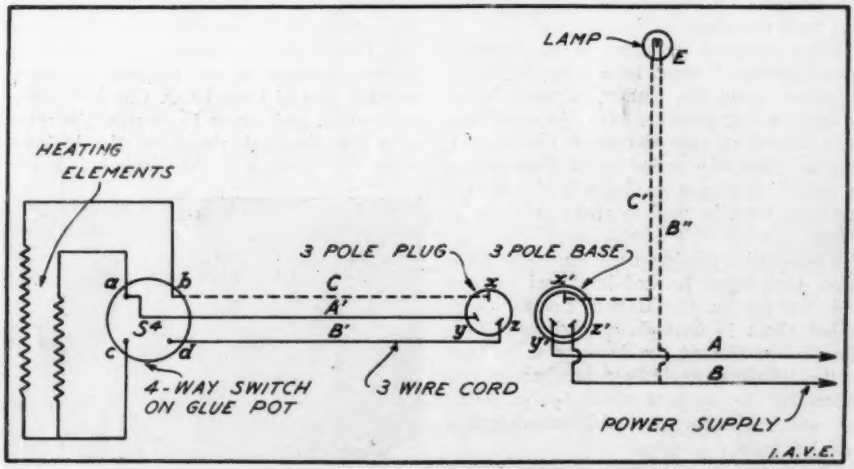


Fig. 1. Wiring diagram

METALWORKING KINKS

William L. Hunter, Iowa State College, Ames, Iowa

Too often, as industrial-arts teachers, we become so engrossed in teaching standardized techniques that we forget that versatility, adaptability, and inventiveness are worthwhile, commendable, and, in some measure, achievable goals for pupils in general education.

The writer would make no claims that the kinks and ideas here set forth are his own. He has gathered many of them from students in his classes, some from coworkers, and a fair number from trips to industrial plants and shops. No matter how poor the student, the teacher, or the shop there is nearly always at least one good idea to be found if one but keeps his eyes open.

Fig. 1

One student, for instance, was faced with the problem of making several right-angle bends in round mild steel stock. He tried slipping a piece of pipe over the stock (see Fig. 1) and was able to make the bends much more neatly and rapidly than otherwise.

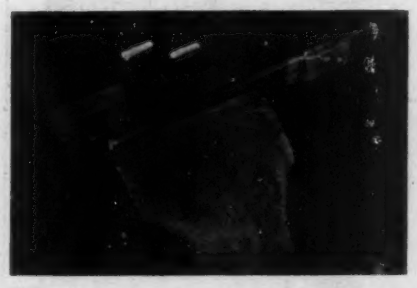


Fig. 2

Another student solved the problem of quickly making an offset bend in mild flat stock (see Fig. 2) by placing the stock in a vise with a short piece of the same material

Fig. 3

on each side. The vise was then tightened and the needed offset was secured.

A short length of automobile spring or other tough piece of steel (see Fig. 3), when slotted, makes an excellent bending fork for various types of bends in flat stock.

One teacher was faced with the problem of peening some small cuplike metal receptacles and cut a piece of pipe (see Fig. 4) with a notch on one side so that it could be held solidly in a vise (see Fig. 5) and used as a hollow anvil or form on which to do the peening.

Fig. 6

Fig. 7

A hammer with a soft face was needed so that a dented fender could be put back in shape. Such hammers, of course, are purchasable but the problem was solved by getting a five-cent crutch rubber and forcing it onto the head of the hammer (see Fig. 6).

Frequently thin spring steel is required on a job. This steel is not easily cut to shape with a hack saw even though turpentine is used for a cutting agent. It may be readily cut, however, by shearing it in a vise with a cold chisel (see Fig. 7). If holes are needed in the spring steel, and it is too hard for a drill, the holes can be punched by using an end-grain block of hardwood (see Fig. 8).

One worker needed several rings of uniform diameter and did the job quickly by winding the wire stock in a springlike coil on a round

Fig. 8

Fig. 9

Fig. 10

form and then cutting through one side of the spring (see Fig. 9). The rings were then shaped, after which they were brazed.

Fig. 11

Frequently one needs slots that are wider than can be made by a single hack-saw blade. Various widths may be secured by adding one

Fig. 12

or more blades to the hack-saw frame so that varying widths of slot may be cut (see Fig. 10).

In turning or grinding round threaded stock in a lathe, one can use a split nut (see Fig. 11) to hold the work securely and yet not mar or damage it.

One student needed a bar folder for a small sheet-metal job. He had none available but did the job very well by using a butt hinge, as shown in Figure 12, to do the bending.

Worn out dentist's tools of varied shapes, when reshaped by means of a torch and rehardened, make most excellent scribers (see Fig. 13).

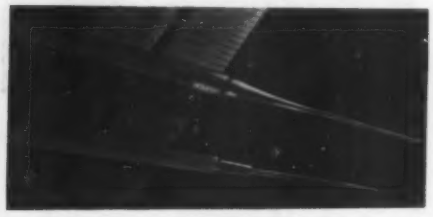


Fig. 13

Fig. 14

Fig. 17

One worker needed a pipe wrench when such a tool was not available. He overcame his difficulty by using a monkey wrench and a rattail file as shown in Figure 14.

A miter box for sawing round pipe may be made from a piece of angle iron (see Fig. 15). A slit is cut in the angle iron so that when

clamped onto the pipe, the hack-saw blade follows the cut in the angle iron (see Fig. 16).

A sheet-metal worker required some zinc chloride for flux purposes. In cutting the muriatic or hydrochloric acid he needed some sheet zinc. Not having any at hand, he happened to remember, that fruit-jar caps were made of zinc. So, when his wife wasn't looking, he took one of her older looking jar caps (see Fig. 17) and cut it up for his purpose.

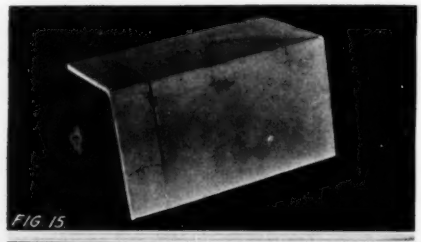


FIG. 15

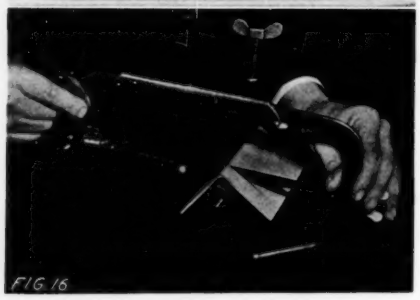


FIG. 16

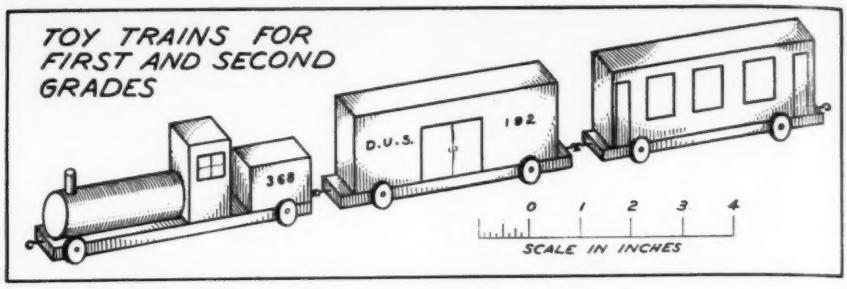
TOY TRAIN FOR FIRST AND SECOND GRADERS

Cavins Baughman, Detroit University School, Grosse Pointe, Michigan

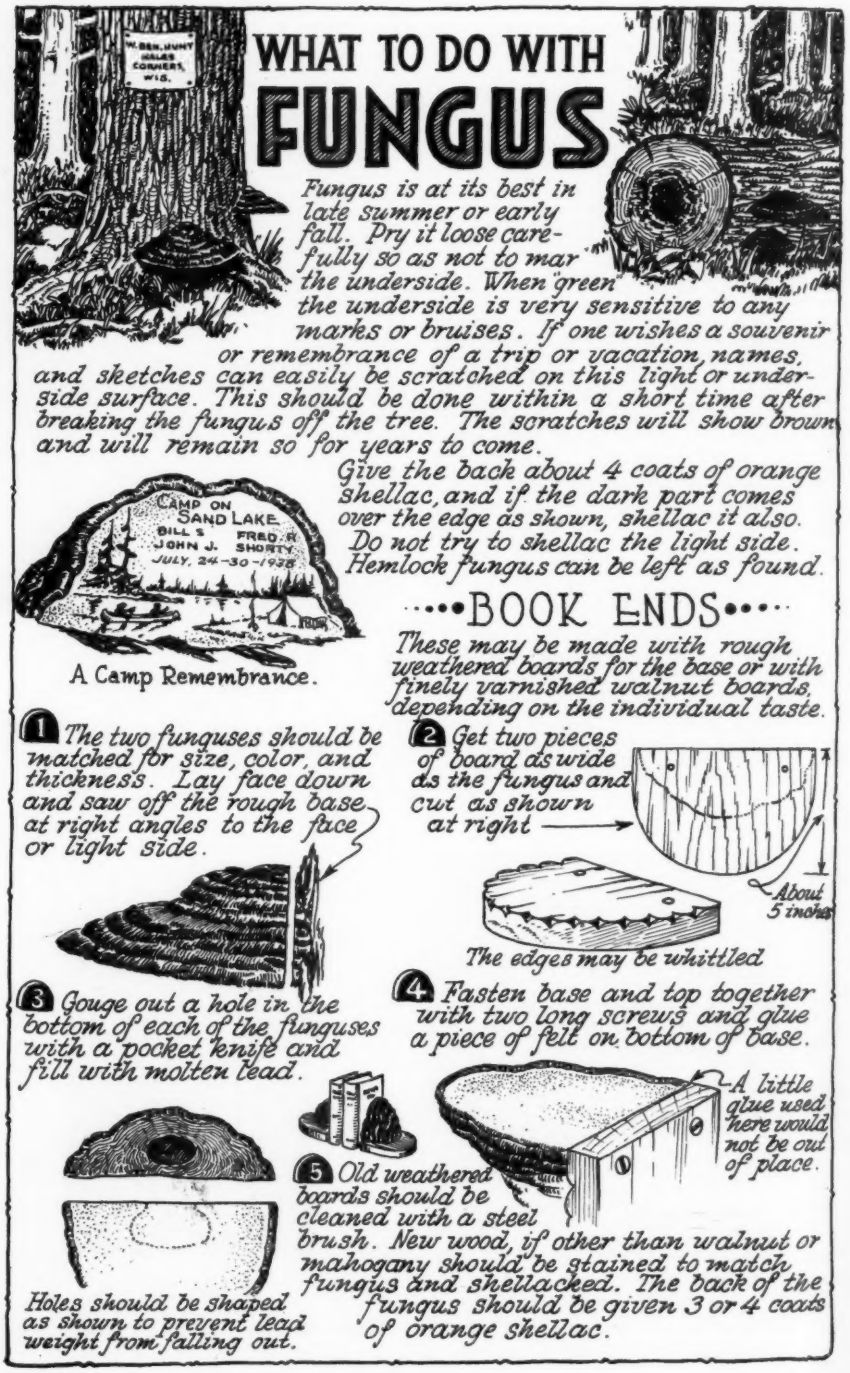
The 1st- and 2nd-grade boys of our school are sent to the industrial-arts shop for 30 minutes every week. The selection of an activity for these very little fellows in the shop has been a problem. The project here described has been successfully used as a beginning job while the boys were becoming adjusted to the shop. It has the following features: (1) it involves only sandpapering, nailing, and painting; (2) it is composed of several units so that the more adept workers may build additional units while their slower classmates work on the minimum; (3) the slight variation in the units holds interest for some time; (4) the material used is mostly scrap.

The project is a very simple toy railway train as shown in the accompanying sketch. The base for each unit is a piece of soft material similar to lattice strip. Four wheels cut from a broomstick are nailed to the base. The locomotive boiler is cut from a discarded mop or rake handle. The smokestack is a short stub of dowel rod glued in a prepared hole. The freight and passenger cars are identical except for the painted trim designating doors, windows, etc. Some more discriminative workmen will round the edges of the passenger coaches. A length of broomstick on the standard base will form a tank car. Brads driven around the edge of a base piece will form a flat car with stake sides. Small screw hooks form the couplings.

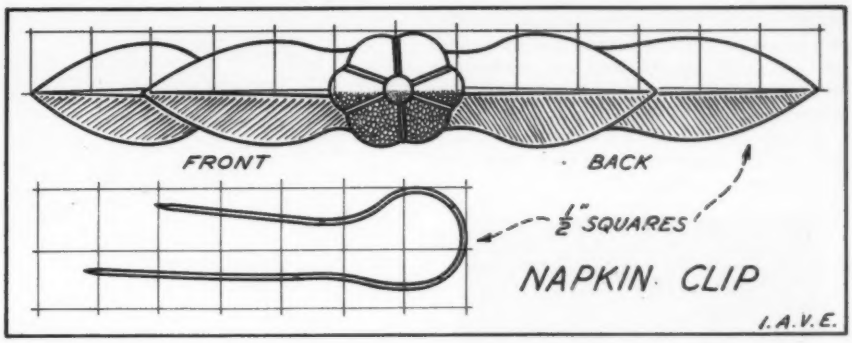
Upperclassmen, taking industrial-arts work, cut the material to size, and bore the holes



A project for the first and second grades


WHAT TO DO WITH
FUNGUS
Fungus is at its best in late summer or early fall. Pry it loose carefully so as not to mar the underside. When green the underside is very sensitive to any marks or bruises. If one wishes a souvenir or remembrance of a trip or vacation, names, and sketches can easily be scratched on this light or underside surface. This should be done within a short time after breaking the fungus off the tree. The scratches will show brown and will remain so for years to come.
Give the back about 4 coats of orange shellac, and if the dark part comes over the edge as shown, shellac it also. Do not try to shellac the light side. Hemlock fungus can be left as found.
CAMP ON SAND LAKE
BILL S
JOHN J.
FRED R
SHORTY
JULY, 24-30-1938
A Camp Remembrance.
BOOK ENDS
These may be made with rough weathered boards for the base or with finely varnished walnut boards, depending on the individual taste.
1 The two funguses should be matched for size, color, and thickness. Lay face down and saw off the rough base at right angles to the face or light side.
2 Get two pieces of board as wide as the fungus and cut as shown at right
About 5 inches
The edges may be whittled
3 Gouge out a hole in the bottom of each of the funguses with a pocket knife and fill with molten lead.
4 Fasten base and top together with two long screws and glue a piece of felt on bottom of base.
A little glue used here would not be out of place.
5 Old weathered boards should be cleaned with a steel brush. New wood, if other than walnut or mahogany should be stained to match fungus and shellacked. The back of the fungus should be given 3 or 4 coats of orange shellac.
Holes should be shaped as shown to prevent lead weight from falling out.

for the smokestack and axle nails. The little fellows sandpaper the parts and then nail them together. Thin black paint, easy to remove from little fingers, is used. The window trim frequently has to be touched up a bit while the boys are away! All will build the locomotive and one other unit. The fast workers will add quite a string of rolling stock. It is suprising how this project has appealed to boys who have elaborate toy trains at home.



NAPKIN CLIP

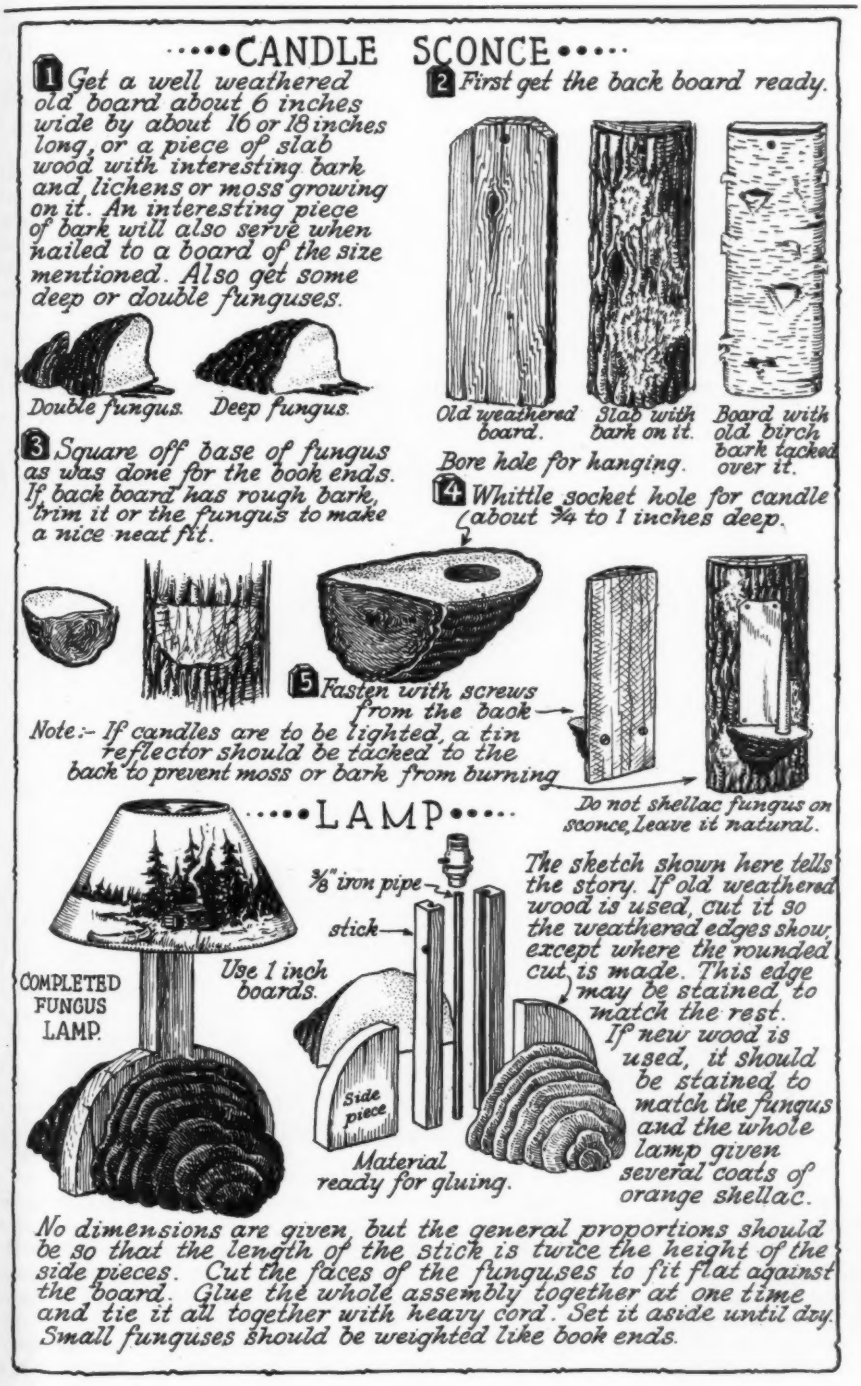
I. A. Smith, Buffalo, New York

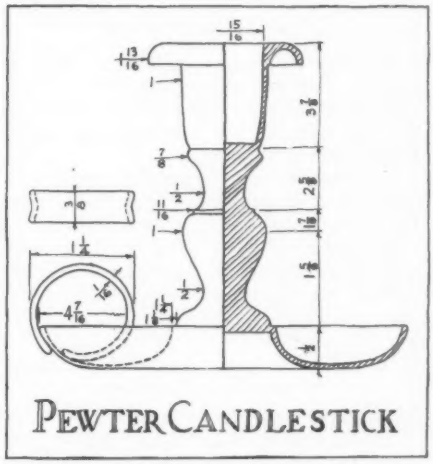
The napkin clip shown herewith is made of a thin strip of 1 by 6½ in. 18-gauge German silver. If preferred, it may be made of copper or brass and plated with silver or chromium.

Lay out a pattern paper. The one shown may be used, or a new design developed to suit individual tastes. Cut out the pattern and glue it to the strip of metal as a pattern for the cutting.

After hammering the clip as shown in the sketch, be sure to file the edges round so they will not cut the material of the napkin. The edges should be beaded. Bend the strip as shown in the side view. If the leaves are slightly convex the appearance of the whole is greatly improved.

This design makes a good substantial clip. It may be reduced in size if a daintier design is desired.


CANDLE SCONCE
1 Get a well weathered old board about 6 inches wide by about 16 or 18 inches long, or a piece of slab wood with interesting bark and lichens or moss growing on it. An interesting piece of bark will also serve when nailed to a board of the size mentioned. Also get some deep or double funguses.
Double fungus.
Deep fungus.
2 First get the back board ready.
Old weathered board.
Slab with bark on it.
Board with old birch bark tacked over it.
Bore hole for hanging.
3 Square off base of fungus as was done for the book ends. If back board has rough bark, trim it or the fungus to make a nice neat fit.
4 Whittle socket hole for candle (about ¾ to 1 inches deep.
5 Fasten with screws from the back
Note:- If candles are to be lighted, a tin reflector should be tacked to the back to prevent moss or bark from burning
Do not shellac fungus on sconce, leave it natural.
LAMP
⅜" iron pipe
stick
Use 1 inch boards.
COMPLETED FUNGUS LAMP.
Side piece
Material ready for gluing.
The sketch shown here tells the story. If old weathered wood is used, cut it so the weathered edges show, except where the rounded cut is made. This edge may be stained to match the rest.
If new wood is used, it should be stained to match the fungus and the whole lamp given several coats of orange shellac.
No dimensions are given, but the general proportions should be so that the length of the stick is twice the height of the side pieces. Cut the faces of the funguses to fit flat against the board. Glue the whole assembly together at one time and tie it all together with heavy cord. Set it aside until dry. Small funguses should be weighted like book ends.



Measured sketch of candlestick in Pennsylvania Museum. Submitted by Burl N. Osburn, State Teachers College, Millersville, Pa.

DRILL RACK AND SOLDERING SLAB

R. W. Wagner, Maria Sanford Junior High School, St. Paul, Minnesota

Figure 1 shows a drill rack made of a piece of angle iron that is backed up with a V-

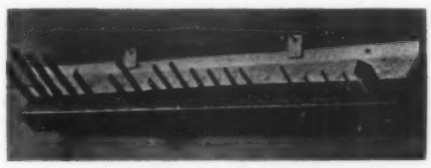


Fig. 1. The drill rack

shaped piece of wood. The rack is held to the wall by means of screws. A piece of galvanized steel on which the drill sizes are indicated is fastened to the wall above the rack.

Above each drill is a nail on which to hang a check when a drill is taken out. The slant of the angle iron makes it very easy to take out or return drills.

Fig. 2. Soldering slab

Figure 2 shows a very efficient soldering slab. A piece of slate (a shingle will do) is enclosed in a shallow tray. In the middle is placed a container for powdered rosin with a brush for dusting it on.

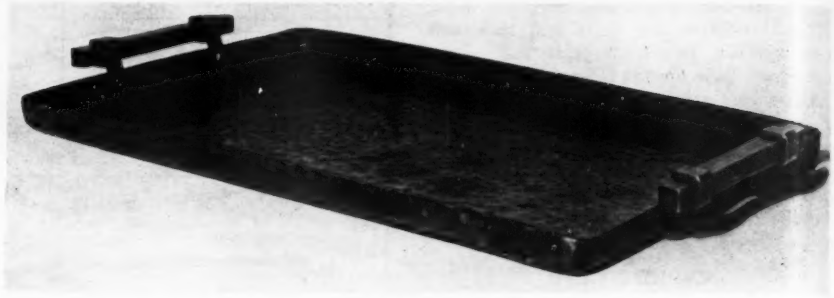
Soldering coppers are readily tinned on a slab of this kind. File the point of the copper to shape. Then scatter some rosin on the slab, place a few drops of solder on the rosin, and rub the copper back and forth until the point is properly tinned.

COPPER TRAY

C. Knutson, Peckham Junior High School, Milwaukee, Wisconsin

The copper tray shown is made of a 12 by 18-in. sheet of 14-gauge (B.&S.) copper. This piece is first squared and then planished. Planishing should be done on a very smooth surface. When the planishing is finished, the sides should be straightened by cutting or filing. The stock should be annealed before attempting to turn the sides up. For turning the sides and corners, an iron block is used, which has two top edges and one corner, rounded. Use a marking gauge, set for ¾ in., to mark off the sides which are to be turned up. By placing the iron block on the corner of a bench and clamping the copper over it, the sides may be turned down gradually with a wooden mallet. The corners are not cut and soldered but are shrunk. This is done when the metal is hot and it is very necessary that the excess metal be kept cut off to relieve the strain. If the corner is worked after it has become cold the metal has a tendency to become so brittle that it will crack.

The handles are made of ½-in. square copper bar 5¾ in. long. The brackets which hold the handles are made of ⅛ by ½-in. copper strips. These are fastened to the tray with 3/16-in. r.h. copper rivets.



Copper tray

The tray should be buffed very thoroughly with tripoli. The antique finish is obtained by using liver of sulphur or barium sulphide, and high-lighting it with steel wool or a coarse washing powder.

INDOOR ARCHERY BACKSTOP

Allen Glisch, Milwaukee, Wisconsin

As archery students will occasionally miss the target, a backstop is necessary to prevent the stray arrows from getting damaged. The backstop shown in the photograph was made by nailing four thicknesses of large sheets of corrugated cardboard to a wood frame, preferably with an easel support.

The cardboard can usually be obtained from a local department store as they often receive merchandise packed in large cartons.

A backstop of this type is almost indispensable in schools and clubs where archery is practiced on an indoor range.

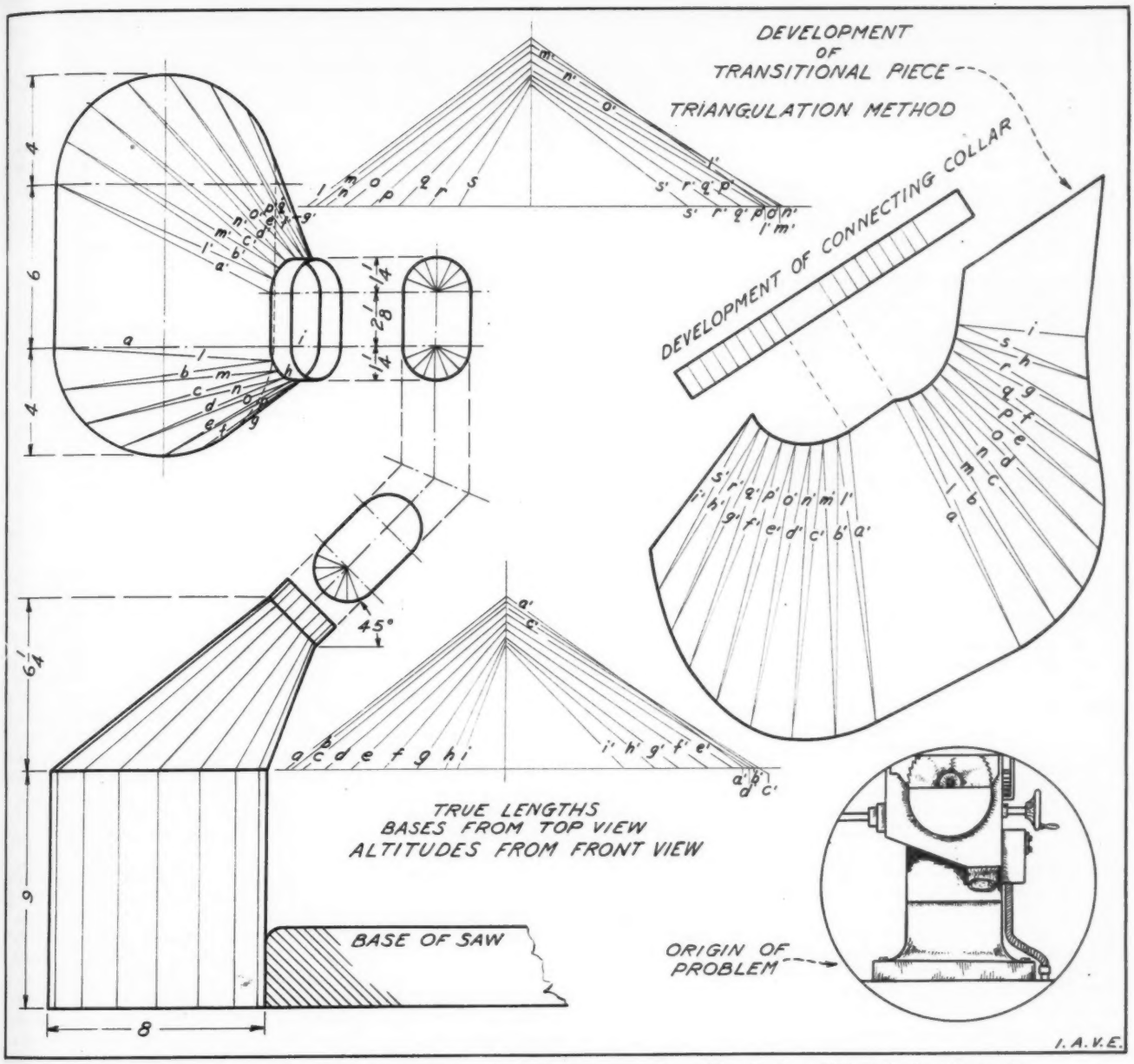
Indoor archery backstop

SAWDUST HOPPER

Clifford L. Yard, Junior-Senior High School, Hastings-on-Hudson, New York

Much interest and genuine drafting experience were produced through the designing and making of the sawdust hopper described in this article. The drafting class was taken into the woodshop with sketch pads to gather the required information for this problem. The required data embraced such items as the size of the sawdust chute, its height from the floor, its slant, the clearance from the base of the saw to the chute, and the like. The problem was presented in the form of a contest in order to challenge the creative abilities of the members of the class. The winner was to be honored by having his design converted into a sawdust hopper by a committee consisting of the designer as chairman, the other members to be elected from those who had taken sheet- or general metal work.

The class then set up the following requirements for the project: (1) It should be a



Sawdust hopper designed at Junior-Senior High School, Hastings-on-Hudson, New York — Clifford L. Yard, instructor

sheet-metal sawdust chute which would rest upon the floor. (2) It should be out of the way of the operator. (3) It should be clamped to the chute so that it would be easily removed and replaced. (4) It should have a neat appearance.

The best design was to be selected on the basis of usefulness, neatness of design, efficiency of construction, and drafting technique.

This type of problem goes far toward offering a complete experience, for the students work out the details of the problem, plan the procedure, and then construct the project. The contest also afforded them the opportunity to make a critical analysis of a variety of designs (no two were alike) during the process of selecting the winning design, and finally they saw this design made full size in sheet metal, and used in the shop. Their interest and satisfaction are manifested by

the number of times the members of the drafting class go to the woodshop to "take a peek" at the hopper in use.

BOX LOOMS AND ROLLER BOX LOOMS

R. H. Jenkins, Humboldt State Teachers College, Arcata, California

The box loom shown in Figure 1 follows rather naturally in the development of weaving, after the work in cardboard. It is a very simple and efficient type of loom, and is easily made. The size can be varied to suit the purpose for which the loom is designed. A satisfactory small loom for children can be made from orange and apple boxes. The heavier portions of these boxes make good material for the ends of the loom, and the thinner strips do nicely for the sides.

To get material for the loom, saw the box

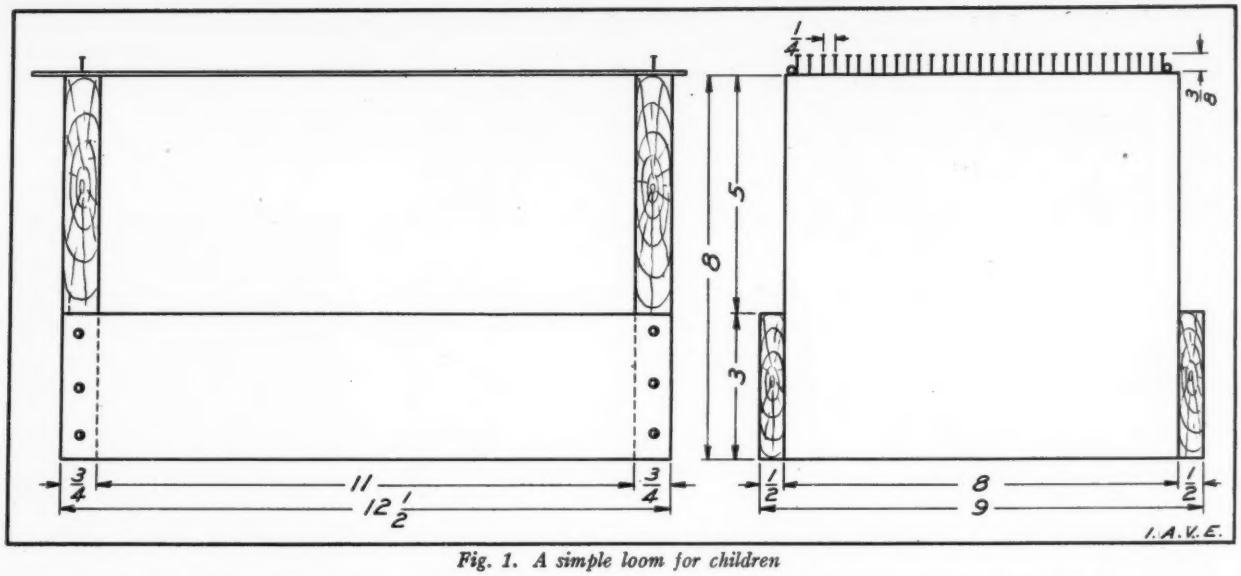


Fig. 1. A simple loom for children

apart. This is better than trying to take the box apart with a hammer. If the sawing is done close to the ends, there will be little loss of material, but the pieces will not be split, as they usually are when they are driven off with a hammer. Draw the nails from the end of the box and cut out two pieces suitable for the head and foot of the loom. These pieces should be about 8 by 8 in. For the sides, cut two 3 by 12-in. strips from some thin material. These sides should be nailed to the two ends of the loom, and should be fitted close to the bottom, so as to leave plenty of room above for the weaver's hands. On the top edge of the head and foot of the loom, drive in No. 18, ¾-in. brads, space ¼ in. center to center. Drive these brads so that ⅜ in. is left above the surface, and if the wood is inclined to split, alternate or stagger the brads from the straight line about 1/16 in. Tie two pieces of No. 10 gauge wire on each side of the loom. These are used to keep the selvage of the weaving straight. When the weaving is complete, the wires are cut loose from the brads and drawn from the work, leaving an evenly finished edge.

A number of weaving projects can be carried out on these looms, by using various kinds of waste material. Ordinary cotton string makes good warp, and rags torn in strips furnish the weft for many interesting pieces of weaving. Burlap and string, nigger-head grass and string, pine needles and string, silk stockings and mercerized cotton thread, two colors of yarn, and many other materials may be used. Some of the objects to be made from these materials are doll-house rugs, handbags, doll hammocks, grass rugs, hot-dish holders, and table mats. The weaving can be the plain, simple under and over type, or the more complicated forms if the worker is willing to plan the design and work out the process. The main difficulty in design weaving on this type of loom lies in the fact that the warp threads are often too far apart in proportion to the number of weft threads. This creates a tendency for the weft threads to cover the warp threads and completely hide the design. Stripes and designs of such a nature are much more easily worked out and make a pleasing effect.

The Roller Box Loom

The roller box loom shown in Figure 2, is simply a development of the previous loom, and is constructed on the same plan with only a few modifications and additions which materially improve the efficiency of the machine. In the first place the dimensions can be much larger. In fact, the width can be great enough to accommodate a full-sized rug and the length sufficient to give plenty of working space. At each end is a roller upon which is rolled the surplus stock. The initial roller carries the extra warp, while the finishing roller holds the completed woven goods. With this combination, goods of any length may be woven. Strips of burlap, shown at *AA*, Figure 2, are fastened to each roller, and are used to save a loss in warp, which would otherwise be incurred in the process of weaving. The strips are long enough to reach from the roller to the head and the foot of the loom and save that length of warp which would otherwise be wasted. The ¾-in. brads which were used in both ends of the box loom are now placed only in the head or beginning end of the loom. If driven in both ends of the loom, they would prevent the finished work from passing over the foot and down around the roller.

The warp is transferred to this loom by warping board method. This is a simple process, which is more fully discussed farther on in this series of articles on looms. Without a heddle and beater, the weaving on this loom is done by exactly the same process as on the first loom. The cross or lease sticks, shown in Figure 3, may be used with this type of loom and will aid greatly in keeping the warp threads in order. They are made of ¼-in. dowels, and should be long enough

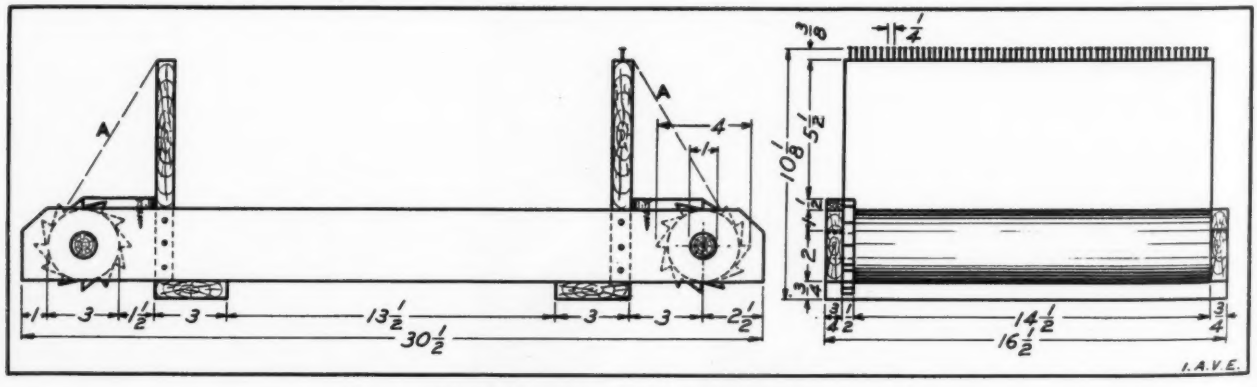


Fig. 2. Adding the rollers makes the box loom more useful

to reach across the piece of work.

The homemade combination beater and heddle shown in Figure 4, also may be made. This will materially speed up the process of weaving. This device is quite simple and is fairly practical if carefully made and used. It has two chief faults, however. Because of the nature of its construction, it will not permit the use of many warp threads to the inch, and the wood is inclined to wear out the warp threads in the process of beating. It does work quite well for simple carpet or rag weaving, however, and is a big improvement over no heddle or beater at all.

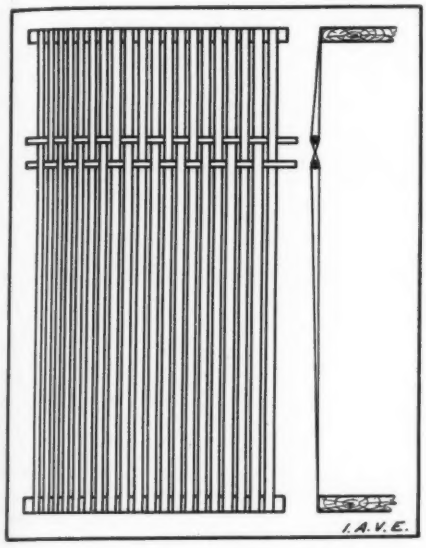


Fig. 3. Cross or lease sticks

The Combination Heddle and Beater

Weaving is a slow process as long as one is forced to pass his shuttle under and over each thread by hand, and thus the next step is to design some type of heddle. This can easily be solved by making a frame of wood and tying on it string heddles. However, such an arrangement is not entirely satisfactory because the warp is inclined to stick to the string of the heddles. Nevertheless, this aid in weaving makes the work faster than the beginning method. A coarse comb may be used as a reed or beater to still further help in speeding up the process.

If this frame with string heddles is used, only one frame is absolutely necessary as the alternate warp threads are the only ones that must pass through the heddles. This does, however, give only half the width of opening or *shed*, that two heddles would, and it is the lack of one heddle that makes the threads inclined to stick. Two heddles without a frame to hold them are awkward to use, however, so it would be well to try one at first.

This leads up to the combination heddle and beater, shown in Figure 4, and after some experimenting, it will be found not so very difficult to design such a combination, though to do it, and to make such a machine perfect, are two quite different matters. In fact, any homemade device is only partly satisfactory, so that it is only through the field of loom development that it is worth while to give such a device a careful trial.

A simple combination design can be made by using some ordinary thin, three-ply wood. Take a piece 7 in. wide and long enough to span the entire width of the loom, say 15 in. Along one 15-in. edge, mark off an inch line. Two and one half inches below this, mark off another line parallel to it, and on this line mark every quarter-inch point. Drill holes with a 3/16-in. bit on alternate dots the entire length of the line. With a square, draw lines across the board on all the remaining dots. Make the lines reach from the one side across the board to the inch line that was first drawn. With a saw make cuts on all the lines, sawing from the edge completely through to the one-inch line. Sandpaper each cut, and make each hole as smooth as possible. Along the open edge fasten with brads and glue two thin ½-in. strips. These are placed on opposite sides of this open edge in order to give the beater strength.

To use, place in a convenient position on the roller box loom, when the loom is ready for stringing, and run all the warp threads through the saw cuts and holes. String the threads in regular order, alternating cuts and holes and watching especially that this order is not broken. Tie the ends of the warp to the burlap and draw the whole mass to an even tension by turning the rollers, and fastening the catch on the ratchet.

By first pushing down and then lifting, the two "sheds" are made for plain weaving, and by forcibly sliding the frame along on the warp some satisfactory beating is accomplished. However, there are two problems which confront one on this type of machine. For one thing the warp is too far apart for fine weaving so that the threads show only in the one direction when the beating is tightly done. For the other the beater wears the warp down very rapidly, so that the threads are inclined to break. But even with these faults this combination heddle and beater is a decided improvement over the beginning box loom with its slow process of weaving.

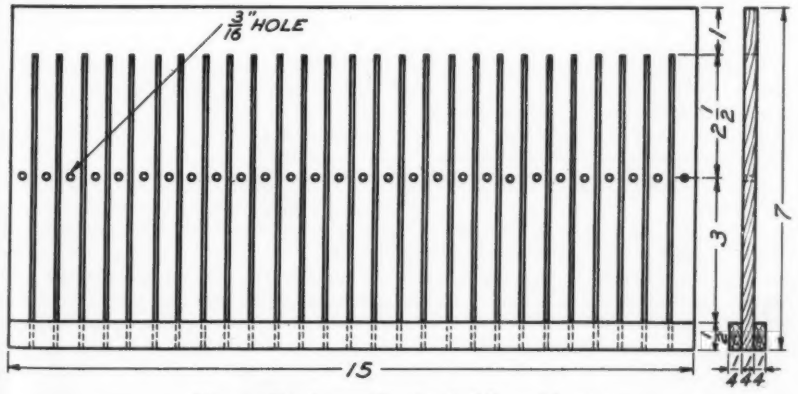
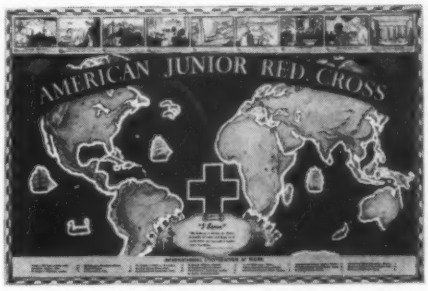


Fig. 4. Simple combination heddle and beater



THE MORTISE-AND-TENON JOINT—X

John E. Doren, Eureka High School, Eureka, California

(Continued from page 215, May, 1938)

Case II. Width of Groove Considerably Less Than One Third the Thickness of the Stock

With the increasing use of plywood panels for cabinet doors, the cabinetmaker is confronted with the problem of using panels that are much thinner than one third the thickness of the stock used for stiles and rails. When this condition occurs, the thickness of the panel has no influence on the thickness of the tenon, for if the tenon were made the same thickness as the thin panel, the resulting joint would be too weak to be of practical value. In this case, the thickness of the tenon should be determined by the size of the standard mortising chisel nearest to one third the thickness of the stock to be used for stiles and rails.

A. Stock Grooved on One Edge

In Figure 75 is shown the top rail and stile of a small cabinet door with both members grooved for a very thin panel. A study of the figure will reveal the relation of the mortised and tenoned members, and the relation of the groove to both the mortise and the tenon. Notice that the stile is recessed to receive the tenon haunch which is just long enough to fill the recess.

The panel groove, by common practice is made ¼ to 5/16 in. deep even though the panel may be only ⅛ in. thick. Whenever practical, the groove should be made in the section of the stock that forms the tenon, but need not be in the exact center. It may even be at one side or the other of the center, as shown in Figure 76, so long as the groove lies entirely within the tenon, in which case the groove will be entirely concealed when the joint is assembled. The purpose of this recommendation is to provide for a strong joint and neat work with a minimum of labor.

But if the panel groove is cut in a section

of the stock not entirely included in the tenon, the groove will show open at the ends of the stile when the joint is assembled unless considerable extra work is done to conceal it. The arrow at B in Figure 77 shows the effect of the groove when it is not entirely within the section from which tenon is formed, and at C is shown the unsatisfactory appearance of the assembled joint.

To cut a tenon to completely fill the mortise and recess in a stile such as the one shown at A in Figure 77, the tenon will have to be cut with a fillet in one corner of the tenon cheek and a shoulder as illustrated in Figure 78. This involves almost double the labor that is involved in cutting the tenon on stock in which the groove lies entirely within the tenoned section.

B. Rail Grooved on Two Edges

An example of a tenon on a common rail with corresponding mortise in the stile is shown in Figure 79.

In this case, the width of the tenon is usually made the same as the width of the rail as shown in Figure 79, but there are men who advocate the relishing of the tenon on both edges as shown in Figure 80, but unless the relishing is well done a poor fitting joint will result.

In a case of this kind, unless the joint is fully detailed on the drawing, the worker must use his own judgment as to whether to use the full-width tenon shown in Figure 79 or the double relished tenon (Fig. 80), but it is generally conceded that the full-width tenon is the more easily made and produces the better joint.

Case III. Stock Grooved for Thick Panels — Width of Groove Considerably Greater than One Third of Thickness of Stock

A. Rail Grooved on One Edge, Stile Grooved Full Length

Here is a case that is rather unusual, yet at times has to be met. An example of the mortise-and-tenon joint as applied to the joining of the top or bottom rail to a stile is shown in Figure 81.

If the stock is grooved before the tenons are cut, the most practical joint is the tandem tenon shown in Figure 81, the long tenon to provide the strength and the stub tenon to provide the haunch to fill the groove in the stile.

B. Rail Grooved on Two Edges, Stile Grooved Full Length

The tenon on the common rail will have the appearance of the one shown in Figure 82. It appears at once that the cutting of the tandem tenons involves considerable work, but there is another variety of tenon that may be used and which is easier to cut, provided that both tenon and mortise are cut before the stock is grooved.

C. Rail Grooved Full Length, Stile Stopped-Grooved

The thickness of the tenon is determined by the size of a standard mortising chisel nearest in size to one third the thickness of the stock.

1. The joint formed between the stile and the top or bottom rail: The stile should be mortised and recessed as shown in Figure 83 to receive the tenon and haunch, and the rail tenoned and haunched to fit the mortise, but when the stile is mortised, due allowance

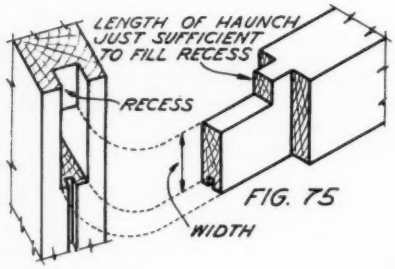


FIG. 75

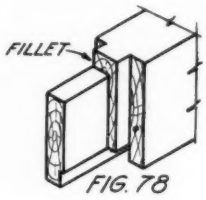


FIG. 78

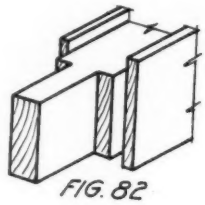


FIG. 82

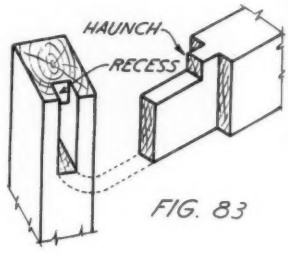


FIG. 83

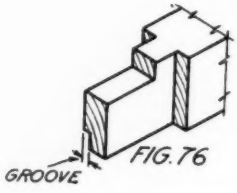


FIG. 76

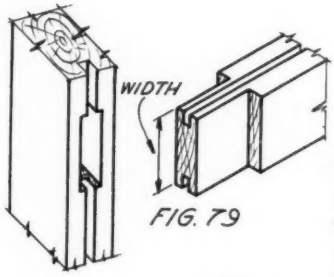


FIG. 79

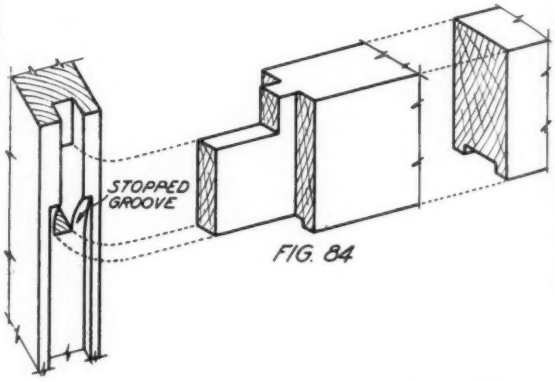
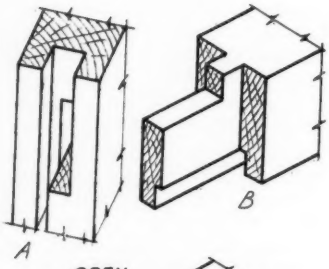


FIG. 84



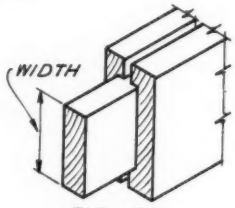


FIG. 80

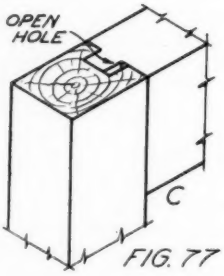


FIG. 77

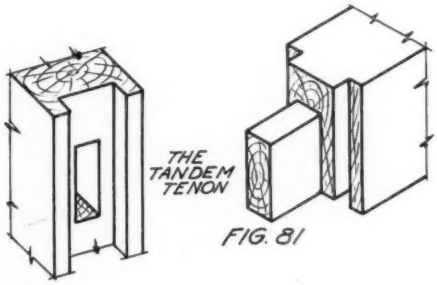


FIG. 81

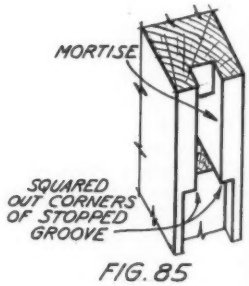


FIG. 85

must be made for the reduction in width of the tenon due to the groove which is to be cut later.

The rail in this instance is grooved from end to end as usual, but the stile is stopped-grooved, that is, it is grooved from mortise to mortise only. The groove may be run slightly past the near arris of the mortise concealed hollow in the work to which some mechanics object.

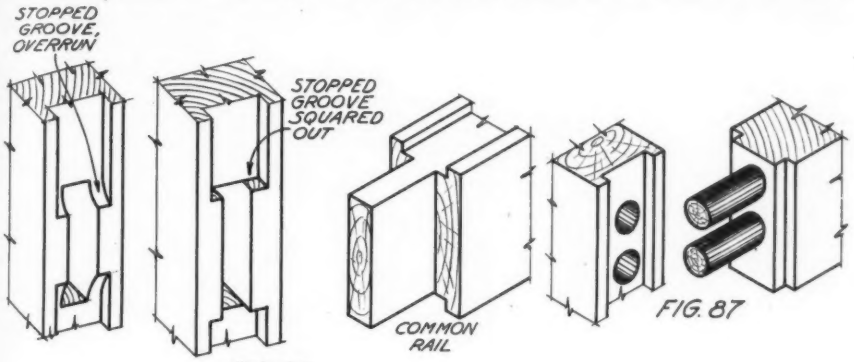


FIG. 86

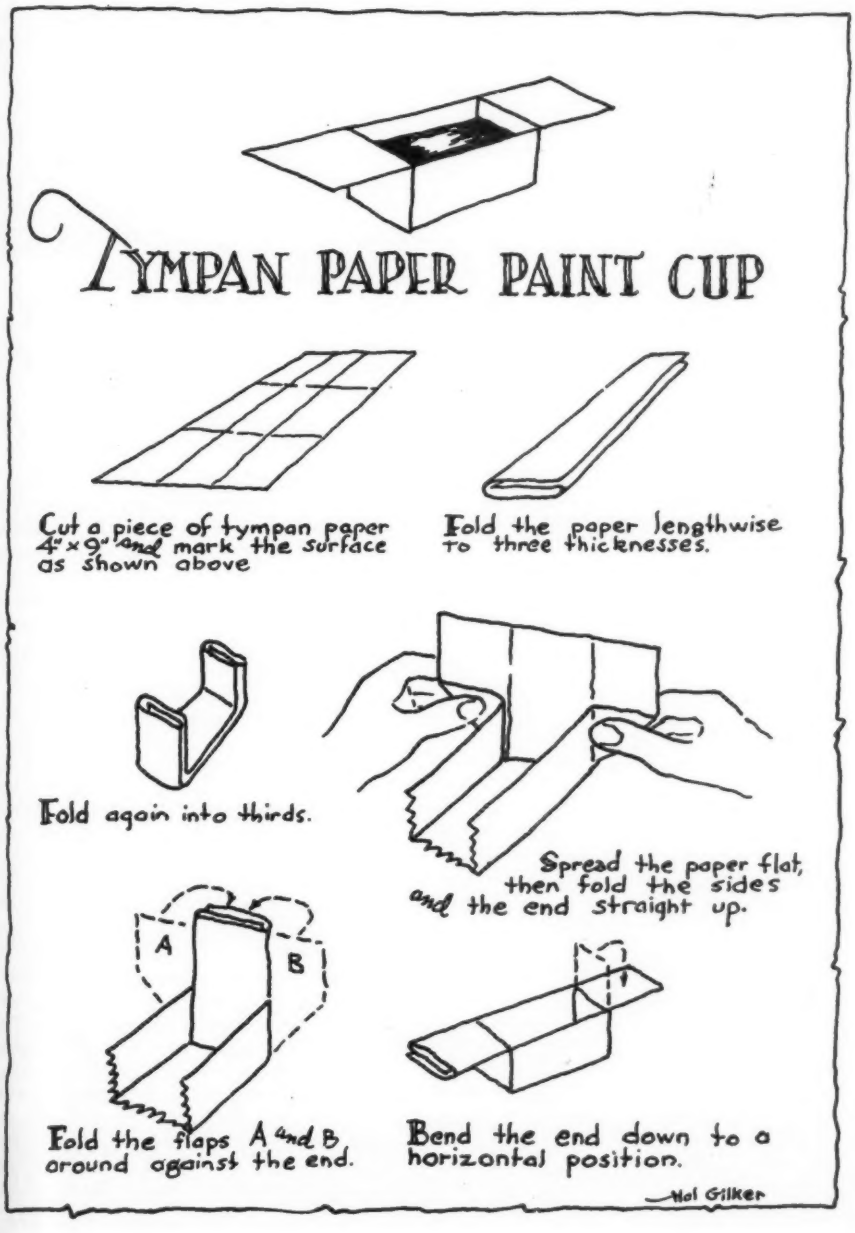
FIG. 87

When greater refinement of work is important, the groove in the stile should be stopped exactly at the arris of the mortise, and as shown in Figure 84, but this will leave a the curved ends cut out (squared out) by hand or on the mortising machine to permit the square corners of the panel to completely fill the groove. See Figure 85.

2. In a similar way, the stile and common rail may be joined. Study Figure 86. The stile is shown with the stopped groove slightly overrunning the mortise, and also squared out.

CAUTION: The groove in the stile must stop at the mortises if strong joints are essential. On cheap work the groove is sometimes cut from the top mortise to the bottom mortise without regard for the joints to be made with the common rails, but this is to be discouraged wherever work of high quality is required.

When panels are considerably thicker than one third the thickness of the stiles and rails, dowels with stub tenons are more practical than tandem tenons and stopped-grooved stiles. When dowels and a stub tenon are used, as shown in Figure 87, the stile may be grooved full length. This makes for less expensive construction.


TYMPAN PAPER PAINT CUP
Cut a piece of tympan paper 4" x 9" and mark the surface as shown above
Fold the paper lengthwise to three thicknesses.
Fold again into thirds.
Spread the paper flat, then fold the sides and the end straight up.
A
B
Fold the flaps A and B around against the end.
Bend the end down to a horizontal position.
Hal Gilker

TYMPAN-PAPER PAINT CUP

Hal Gilker, Green Bay Vocational and Adult Education School, Green Bay, Wisconsin

The need often arises in school shops and home workshops for small, clean paint cups. Tin cans, muffin tins, and paper drinking cups all have been used with success, depending on the adequacy of the supply.

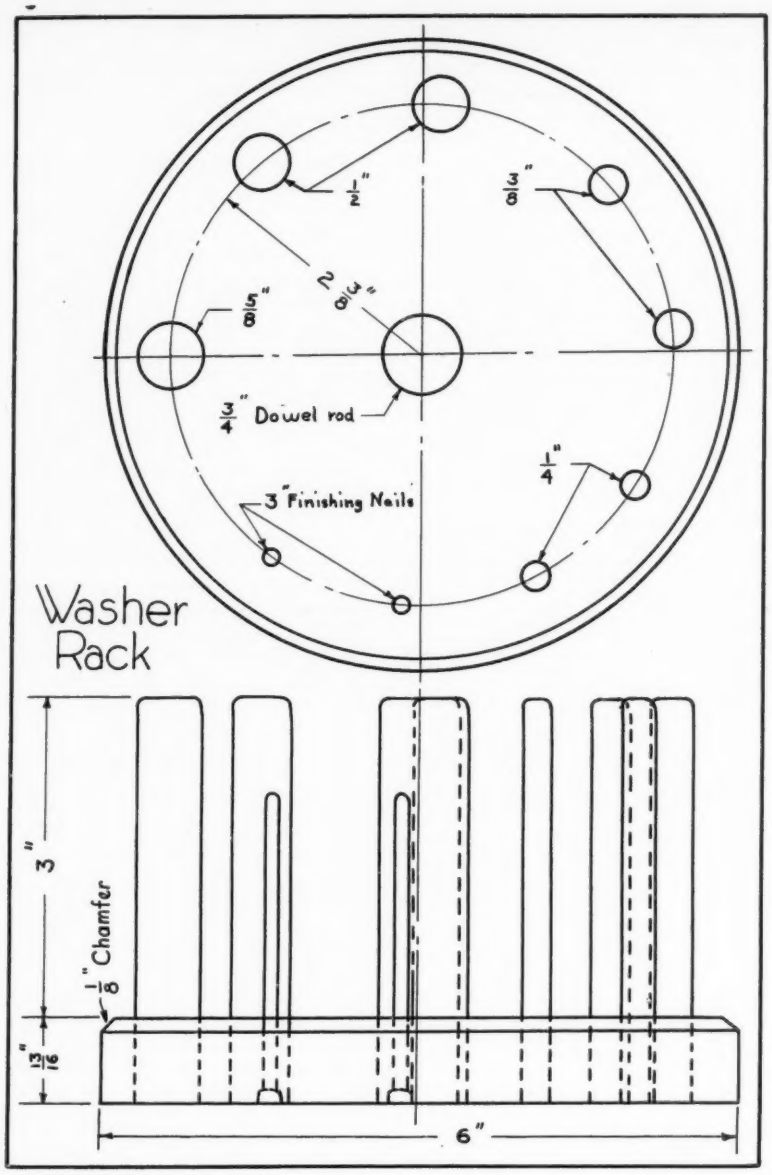
For those who have access to soiled tympan paper, the tympan-paper cup serves as an excellent container. By arrangement with the printing instructor or the local job printer to save used tympan paper, a supply of clean paper cups may be assured for the finishing room.

Tympan-paper cups have several advantages. They cost nothing, may be destroyed after they have been used once, and have a convenient handle for carrying them about. When doing fine work such as trimming, stripping, or lettering, the free end flap serves as a clean surface upon which to "spank" and line up the bristles of the brush.

WASHER RACK

F. W. Dejmek, Marinette, Wisconsin

The washer rack shown in the accompanying illustration will take care of a sufficient number of washers of various sizes to supply the needs of any woodshop where washers are used only occasionally. When a large number of washers are required for a special job, they can be ordered to meet the particular requirements. Racks of this kind are very handy because it is much easier to find a certain size washer on the rack rather than look through several boxes or drawers.



Answers to Questions

REFINISHING A PIANO

1035. Q.: We have a piano, the finish of which has become badly checked. Is it possible to remove these checks without removing the varnish by scraping or with paint-and-varnish remover? I am told that the piano manufacturers use a preparation that fuses with the old finish and removes the checks. If you can give me the name of this preparation and tell me where it may be purchased, I shall be greatly indebted to you. — *G. E. G.*

A.: No piano manufacturer of merit would be guilty of using the material mentioned in your inquiry for he knows only too well that when the finish cracks or checks that its life is through, as it can no longer expand and contract with its wood base. There is no recourse but to strip and refinish the case in its entirety.

We have tried out several of these materials for doing over an old finish and have had them demonstrated by the manufacturers' experts. As a result, we do not hesitate to condemn them completely for they represent nothing but another attempt to dodge necessary work on a par with "getting something for nothing." If the piano is otherwise in good condition, have it refinished by a reputable firm who will do a good job throughout. For the varnish use only a good grade of tough, hard floor varnish such as Pratt & Lambert No. 61. Some research which I did for a group of piano manufacturers some years ago brought to light the fact that their past practice of using a hard polishing varnish over a softer rubbing varnish was the fundamental cause of their varnishes cracking on finished cases. Where a hard, tough floor varnish was used throughout the work, no checking occurred since the finish was uniform in all its film and really gave a better semigloss than by any other method. — *Ralph G. Waring.*

REMOVING CIGARETTE BURNS

1036. Q.: Is there any method of bleaching or removing cigarette burns from furniture? — *J. L. C.*

A.: There is no method of bleaching out cigarette burns from furniture for the simple reason that such stains are real burns and generally deeper than is at first realized. The only recourse is to strip the piece and refinish. — *Ralph G. Waring.*

JAPAN DRIER

1037. Q.: Is there any difference between brown Japan and Japan drier? Should they be used in the same proportions? — *J. L. C.*

A.: No, essentially there is no difference. It is best, however, to use the grade known as "turpentine Japan drier" since this employs a better quality of oxides than is generally used in the brown japans, there being less danger of "burning" linseed oil than with the resinates of cheaper grades. — *Ralph G. Waring.*

STAINING REFINISHING JOBS

1039. Q.: I have had trouble in getting a stain to penetrate maple wood, in refinishing furniture after the old finish has been removed. The surface was thoroughly washed with alcohol after remover was used. What type of stain is most satisfactory and how should I proceed? — *J. L. C.*

A.: Probably your trouble is due to the fact that you do little or no sanding after stripping the work. You cannot expect to get penetration unless the work has been sanded white. Any commercial water stain will do the work after the sanding has been done. — *Ralph G. Waring.*

WATERPROOF CELLOPHANE

1044. Q.: I am interested in knowing the type of mixture which may be used on cellophane for waterproofing and at the same time not affect the transparency to any great extent. The mixture should eliminate the shrinkage which takes place in cellophane when drying out and should not alter the nature of it by causing it to become easily cracked or torn. Briefly, I am interested in knowing the process which is used on the new umbrellas and rain capes recently put on the market. This treatment would seem satisfactory for the purpose desired. I would like to use this treated cellophane to cover drawings. Untreated cellophane is unsatisfactory for this purpose because it is very sensitive to the action of moisture in the air. — *W. S. M.*

A.: The material you desire is not something which can be applied to the sheets which you call "cellophane," but the proper grade of cellophane itself. This material is made in several grades, some highly hygroscopic, others almost, if not entirely, waterproof. The Du-Pont Co., Cellophane Division, Wilmington, Del., will be glad to give you information about the different types. My own suggestion to protect your drawings is that you use the much cheaper and more practical method of stretching your drawings and then spraying them with a thin coat of water white lacquer

(Continued on page 12A)

DISSTON MAKES

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How to use tools? The right tools to use? Disston has answered these questions for many years . . . by making the tools most needed for school shop use.

Disston also issues charts for the school room and literature of an educational nature for the use of teachers in vocational instruction.

In addition, a service of repairing and refitting saws used as school equipment at nominal cost was adopted years ago in order that schools could get the best possible results from equipment used.

Write us about this Disston vocational service. Samples of Disston Hand Saw Chart, File Chart and Hack Saw Chart, and educational literature will be sent to instructors upon request.

HENRY DISSTON & SONS, INC., PHILADELPHIA, U. S. A.

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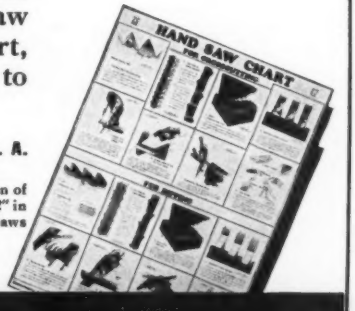
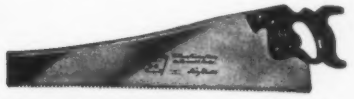
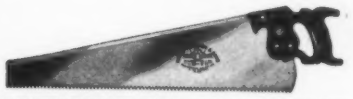


At right is shown miniature reproduction of Disston Hand Saw wall chart, 17" by 22" in size. Similar charts on Files and Hack Saws are available to instructors.

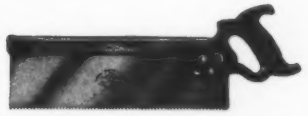
A Few Useful Disston Tools



D-8 REGULAR PATTERN, Skew-Back Hand Saw. 20, 22, 24 and 26 inches. Also made in Lightweight Pattern in 26", differs in width of blade only.



D-7 REGULAR PATTERN, Straight-Back Hand Saw. 20, 22, 24 and 26 inches. Also made in Lightweight Pattern in 26".

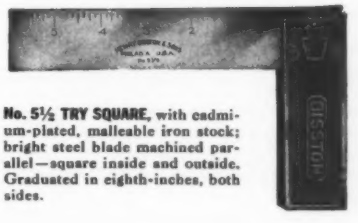


No. 4 BACK SAW, the handiest of all saws for cutting mitres, grooves, tenons, mouldings and other shop work requiring accuracy. 8 to 16" inclusive.

No. 10 COPING SAW, with frame of Disston Steel. Blades available for cutting wood, bakelight, celluloid, bone and composition board.

No. 76 MARKING GAUGE, made of hardwood, with graduated stem. Adjusting screw bears against brass plate in head to prevent wear.

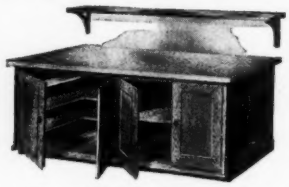
No. 2 BEVEL, with Disston Steel blade; tempered; blued finish. Rosewood handle fitted with heavy brass face plates.



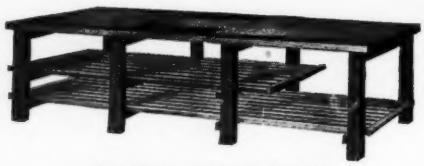
No. 5½ TRY SQUARE, with cadmium-plated, malleable iron stock; bright steel blade machined parallel—square inside and outside. Graduated in eighth-inches, both sides.

Typical Installation of Wood Working Shop

Single Manual Training Bench No. N-3088



Glue and Stain Bench No. N-3154



Metal Worker's Table No. N-3151

Drawing Table No. BL-94

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If there is one thing to look for above another in selecting equipment for your Industrial Arts and Vocational Education Rooms, it is practical utility. Students in these classes have chosen a practical course. Their instructors are of practical minds. That's why both teachers and pupils do better work when Kewaunee Equipment is installed. Every piece is an investment in educational progress—both for your school and its individual students.

Kewaunee Equipment is also the soundest possible investment from the standpoint of design, materials, construction and years of service. The hidden features of strength and the many built-in conveniences give you extra value for every dollar paid. Yet because of Kewaunee leadership and Kewaunee manufacturing facilities, you pay no price penalty for this superior Kewaunee equipment. Write for specifications and prices on the Furniture your school needs.

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(Continued from page 408)

for metal finishing. This will leave them entirely flexible and at the same time make them practically waterproof if the finish is applied on both sides. — *Ralph G. Waring.*

MAPLE FURNITURE

1042. Q.: Will you tell me please, what woods are used in the manufacture of the so-called maple furniture which is quite popular now? — *H. J. P.*

A.: A survey of the woods shown at the last Furniture Mart display indicates that rock maple or hard maple is first, followed by beech, birch, or even cherry in some cases where the red of the latter wood does not interfere with the color of the finish. Personally, I am strongly opposed to the use of any red in so-called "maple finishes" since all are imitations of antique maple colors produced by generations of exposure and use. In none of these cases is any trace of red possible. — *Ralph G. Waring.*

Personal News

• Mr. J. E. Grinnell, formerly Director, Department of Liberal Arts, The Stout Institute, Menomonie, Wis., has been appointed Dean of Instruction, Indiana State Teachers College, Terre Haute, Ind.

• A. R. Nichols, Director of Vocational Education, San Jose Public Schools, served on the faculty at the University of California in Berkeley during the past summer. He taught courses in "Curriculum Construction for Vocational Programs."

• Charles R. Kinison, Associate Professor of Industrial Arts, has been appointed Chairman of the Department of Industrial Arts at Ohio University, Athens, Ohio.

• James O. Stephan has been appointed instructor in charge of the general-shop laboratory and the metal laboratories at Ohio University, Athens, Ohio. He was awarded a baccalaureate degree by the West Virginia University, Morgantown, W. Va., and a master's degree by the Ohio State University, Columbus, Ohio.

• The graduate industrial-arts program of the summer session just past at the Ohio University, Athens, Ohio, was in charge of Associate Professor Charles R. Kinison. He was assisted by F. Theodore Paige, instructor in the woodworking laboratories, and by G. O. Wilber, visiting lecturer, who directed the work in the metals laboratories.

• Ray L. Berger has been appointed to reorganize the industrial-arts course now offered at the high school at Algoma, Wis. He will also coach the high-school football team.

• William Templeton and Miss Lora Pearce have been appointed to help students taking up the new co-operative courses, inaugurated in the Richmond County schools, Ga., to co-ordinate their school subjects with the work done on the job.

Personnel Changes in the Industrial-Arts Department of the Indiana Public Schools, Indianapolis, Indiana

Elliot C. Hutton has joined the faculty of the Washington High School. He is a graduate of Iowa State College, Ames, Iowa, and has taken advanced work in Oregon State College, Corvallis, Ore. He was formerly teaching in Gladbrook, Iowa.

E. A. Patterson has been placed in charge of general shop, printing, and mechanical drafting at the Thomas Carr Howe Senior High School.

Charles Youngman has been made principal of the Calvin Fletcher Junior High School. For several years he has taught general shop and printing in this school.

Roman J. Dombrow has been appointed teacher of foundry at the Emmerich Manual Training High School.

Guy W. Trickey has been appointed head of the industrial-arts department of the Emmerich Manual Training High School.

Paul W. Covert, formerly head of the Emmerich Manual Training High School, has retired after serving many years as teacher and head of the industrial-arts department in this school.

Donald Moore has been assigned as mechanical-drafting teacher at the Emmerich Manual Training High School. He is a graduate of Purdue University, Lafayette, Ind.

John W. Varley has been appointed as a teacher in the metal-trades department of the Arsenal Technical High School. He is a graduate of Purdue, University, Lafayette, Ind.

Don S. Patterson will teach auto-body repair and painting at the Technical High School.

Garold E. Bramblett has been appointed as teacher in the electrical department of the Arsenal Technical High School.

Merritt E. Bausser has been assigned to the junior-high-school work at Schools Nos. 21 and 82. He is a graduate of Ball State Teachers College, Muncie, Ind.

Ross Cox will be teacher at the Junior High Schools Nos. 58 and 78. He is a graduate of the Teachers College at Charleston, Ill.

Robert Zenor has been assigned as industrial-arts instructor at the Junior High Schools No. 15 and 9. He is a graduate of Indiana State Teachers College.

Wilbur Barton, will teach industrial arts at one of the colored junior high schools. He has

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taught in Mount Vernon, Ind., and is a graduate of the Illinois State Normal School.

RODERICK PURCELL has joined the junior-high-school staff. He is a graduate of Stout Institute with a master's degree in industrial arts from Ohio State University, Athens, Ohio. He will also become chairman of a committee on the revision of industrial-arts courses for special classes.

• JAMES SMITH, formerly of the Washington High School, Indianapolis, Ind., has accepted a position at the William R. Moore School of Technology at Memphis, Tenn.

• WILLIAM H. RUTEN has accepted a position at the University of Nebraska, Lincoln, Nebr.

Association News

♦ Those interested in industrial arts and vocational education will assemble to discuss their problems when the American Vocational Association holds its national convention in St. Louis, November 30 to December 4. Not only specialists in the field, but school administrators and educational leaders will be there to consider industrial arts and vocational training in relation to other phases of education and to the preparation of youth to fit into the country's social and economic structure.

All branches of the work — agricultural, commercial, home-economics, part-time, industrial arts, and industrial education — as well as the related subjects of vocational guidance and rehabilitation, will be represented. A three-day meeting of the National Association of State Directors of Vocational Education will precede the general convention.

Nationally known speakers are scheduled for the general meetings, while sectional meetings will be addressed by specialists in their own field. A banquet and an entertainment by the "Ship" head a long list of social features planned for those who attend.

Educational headquarters for the convention will be the Herbert S. Hadley Vocational School, St. Louis. This school, which covers more than a city block, with a floor area of 373,629 sq. ft., has a total enrollment of 7,000, of whom 3,454 are taking full daytime courses. Three commercial and 19 trade courses are offered to four-year students. In addition, six short commercial courses are given high-school and college graduates. An extensive part-time training program for employed workers has been organized with the co-operation of labor unions and employer groups. Classes are held in the evening, Saturday morning, or on week days.

Delegates may also visit the David Ranken Jr. School of Trades, a well-known privately endowed institution, and the Booker T. Washington Vocational School, where 535 Negro pupils are enrolled.

The Missouri Vocational Association, of which State Superintendent Lloyd W. King is chairman, is making extensive plans for the meeting. Local arrangements are being carried forward under Dr. Henry J. Gerling, superintendent of instruction of the St. Louis public schools, and Mr. F. J. Jeffrey, assistant superintendent in charge of vocational schools.

Officers of the American Vocational Association are: President, Thomas H. Quigley, president of the Georgia School of Technology, Atlanta, Ga.; treasurer, Charles W. Sylvester, director of vocational education, Baltimore, Md.; executive secretary, L. H. Dennis, Washington, D. C. Vice-presidents are: R. H. Woods, Frankfort, Ky.; B. J. Knauss, Chicago, Ill.; Ruth Freegard, Lansing, Mich.; R. W. Selvidge, Columbia, Mo.; John J. Seidel, Baltimore, Md.; O. D. Addams, Salem, Ore.; A. K. Getman, Albany, N. Y.; Robert Lee Lynum, Nashville, Tenn.

♦ The Michigan Industrial Education Society is hard at work on the preparation for its next convention which will be held in Grand Rapids, Mich., April 27–29. The officers of this organization are: Arthur L. Reagh, Grand Rapids, president; Thomas P. Garrity, Detroit, vice-president; C. E. Highlen, Muskegon, secretary-treasurer.

For information concerning the meetings and for reservations for exhibit spaces write to the secretary.

♦ The Kansas Industrial Arts Association will hold its convention November 4–5, at Topeka, Kans.

Dr. O. A. Hankammer, Pittsburgh, will be the chairman at the first general session. At this time, the reports of the curriculum study committee and of the committee on revision of the constitution will be heard. At the second general session, which will be held on Saturday morning, Dr. Homer J. Smith, Professor of Industrial Education, University of Minnesota, Minneapolis, Minn., will give a talk on "Reactions to Trends." The business session will be devoted to the election of officers and the selection of the 1939 convention city.

At the sectional meeting devoted to drafting, Friday afternoon, D. W. Brown, Wichita, will preside. Joseph W. Paul will speak on "How the 'Syllabus of Mechanical Drawing Courses for Illinois High Schools' was Developed."

Oscar J. Palmer, Topeka, will be the chairman of the section devoted to electricity. Gilbert W. Jones, will speak on "Rural Electrification"; Lloyd W. Chambers, Topeka, on "Electric Magic," and George W. Bruce, A. R. Morgan, Russell L. Taylor, Topeka, will present successful electrical-shop projects.

The general-shop section will be in charge of

(Continued next page)

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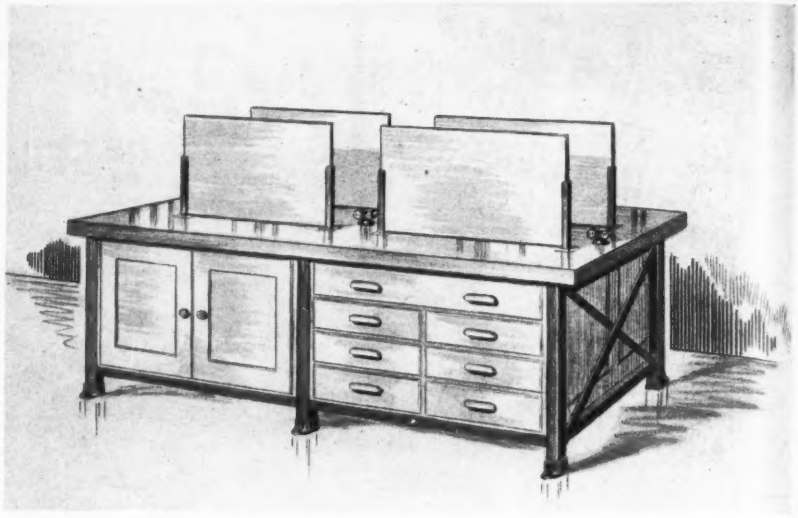
The bench is made of both steel and wood. The frame is of angle steel with steel reinforcements . . . all electrically welded together. The units, equipment, and top are wood. This duplex construction . . . steel frames for strength and wood units for low cost . . . is the same as used in Hamilton Lifetime Steelwood Manual Training Benches. Now installed in hundreds of modern manual training departments . . . it has demonstrated its ability to stand up under hard use.



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TWO RIVERS . . . WISCONSIN

(Continued from page 13A)

C. S. Manrose, Newton. Clark L. Jackson, Emporia, will speak on "Changing Concepts of Industrial-Arts Values in Teacher Training," and Dale Fry, Parsons, on "Organization of the General Shop."

O. P. Stamstad, Kansas City, will be the chairman of the metalwork and auto-mechanics section. Harold E. Robbins, Kansas City, will give a demonstration showing the possibilities of art metal in the school shop. R. P. Jensen, Emporia, will speak on "Metal Spinning as an Industrial-Arts Unit," and H. V. Hartman, Pittsburg, will present a "Report on the State Program of Safety for the Auto-Mechanics Classes."

The printing section will be presided over by Charles D. Winders, Salina. At this meeting, Ferdinand Voiland, Jr., will discuss "New Trends in Typography." C. E. Rune, Topeka, will give a talk on "The Kodachrome Film in Engraving," and Nelson Ives, Topeka, will speak on "Offset Lithography from the Printers' Viewpoint."

The woodworking section will be in charge of L. B. Crumpacker, McPherson. Roy Martin, Abilene, will speak on "Methods of Organizing a Student-Personnel Organization."

Other subjects to be discussed at this meeting are: "How to Overcome Some of the Problems of the Finishing Room" and "Basis for Guiding Students to an Intelligent Choice of Projects that Involve Desirable Learning Units."

♦ The 8th annual convention of the Indiana Industrial Education Association will be held at South Bend, Ind., March 31 to April 1. The officers of this association are: Walter Bunker, president, East Chicago; E. T. Organ, vice-president, Elkhart, and H. G. McComb, LaFayette.

G. F. Weber is the general chairman of the local convention committee. In his work he will be assisted by C. C. Stevason, Earl Webb, and Charles B. Murphy.

♦ The first conference of the year to be held by the Massachusetts Industrial Education Society will take place in Fitchburg, Mass., on Friday, October 21, and Saturday, October 22. Dr. Charles M. Herlihy, president of the Fitchburg Teachers College, has very generously turned the facilities of the institution over to the conference, and round-table discussions will be held during the day culminating in the final address by Dr. William E. Warner of Ohio State University. President Herman Pohlman of the society will preside at the sessions, assisted by the incoming president, Edward Terrenzi. The Friday-evening meeting will be honored by outstanding speakers among whom will be Dr. William E. Warner of Ohio State University. Dr. Warner's subject will be "The Nature and Scope of Industrial Arts in the American Program of Education."

A business meeting will follow at which time the new officers of the society will be installed. They are: Edward Terrenzi, Belmont, president; Gustave A. Larson, Malden, vice-president; Daniel Sullivan, West Roxbury, secretary; A. Irving Dodge, Lexington, treasurer, and Otis Leary, Winchester, librarian.

At the Saturday meeting, the following men will lead and participate in the program: Francis E. Bain, Boston, general chairman; Willis B. Anthony, Fitchburg; Harvey Leighton, Leominster; Dean Eldridge, Plymouth; Francis Reardon, Jamaica Plain; Dr. Dudley, Superintendent of Schools, Amhurst; A. Henry Ottoson, Principal, Framingham, and James J. Hammond, Fitchburg. As a final summing up, Dr. Warner will speak on "A Descriptive Analysis of Several New Developments in Industrial-Arts Education."

A commercial exhibit under the direction of Lawrence Landall and a school exhibit under the direction of Willis Anthony will be on display during the two-day session.

¶ The Missouri Vocational Association will hold its convention November 16 at Kansas City, Mo. The president is Lloyd King, State Superintendent of Schools, Jefferson City, Mo., and the secretary is V. C. Utterbach, Hadley Vocational School, St. Louis, Mo.

New Publications

Air Conditioning — Heating and Ventilating

By J. Ralph Dalzell, B.S., and C. L. Hubbard, S.B., M.E. Cloth, 572 pages, 6 by 8⅝, illustrated. Price, $4. Published by the American Technical Society, Chicago, Ill.

A very comprehensive book on the subject of heating and ventilating. The authors have tried to keep the mathematics involved in the calculations as simple as possible. The principles and general application of steam, hot water, vapor, vacuum, and forced air for heating are quite adequately covered. Split systems for heating and ventilating, and air conditioning for all types of buildings also are included.

A 20 by 15¾-in. psychometric chart accompanies the book.

1937 Model Aeronautics Yearbook

Edited by Frank Zaic. Paper, 160 pages, 5⅞ by 8⅛, illustrated. Published by Model Aeronautics Publications, New York City.

A symposium on model airplanes and gliders, containing not only plans for building, but also excellent articles of a theoretical nature.

The plans and descriptions include 18 gas-powered models, 17 models of the outdoor

(Continued on page 16A)